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ANATOMICAL ATLAS

OF

OBSTETRICS

WITH SPECIAL REFERENCE TO

DIAGNOSIS AND TREATMENT

BY

DR. OSKAR SCHAEFFER

Privatdocent in Obstetrics and Gynecology in the University of Heidelberg

AUTHORIZED TRANSLATION FROM THE SECOND REVISED
GERMAN EDITION

EDITED BY

J. CLIFTON EDGAR, A. M., M. D.

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Medical College; Attending Physician to the Mothers' and
Babies' Hospital and the New York Maternity

With 122 Figures on 56 Lithographic Plates, and 38 other Illustrations

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1901

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EDITOR'S PREFACE.

In the original, Dr. Schaeffer's Atlases were most successful, and we see no reason why they should not be equally popular in the English language.

Volume I. many of us will remember as appearing in a much smaller book in the early nineties; but this has now been much enlarged and brought up to date, with 111 pages of text and over 150 illustrations.

Volume II. contains 314 pages and 160 valuable illustrations. Here we are indebted to the author for a book which, although he terms it an "Anatomical Atlas of Obstetric Diagnosis and Treatment," still, by reason of its profusion of illustrations and diagrams, is in the main a text-book of great didactic value.

The present volume treats particularly of the obstetric operations, and will be found of special value for the student as a book of reference to be used in conjunction with the larger treatises on obstetrics.

As in Volume I., no alterations or additions have been made in the text, with the exception that the English equivalents have been added to all French weights and measures.

J. CLIFTON EDGAR.

50 East 34th Street, New York,
January, 1901.

54059

PREFACE TO THE SECOND EDITION.

THE appearance of the second edition of this work has been much delayed, because both the publisher and the author were well aware that this atlas, which was the first of the series to appear with colored illustrations, has been outstripped by the later issues, both as regards improvements in the technique and the utilization of new clinical material. Meanwhile, the atlases have gained a place for themselves as practical manuals, and for these reasons it became necessary to subject both the illustrations and the text to a complete revision. Most of the colored plates are new, and have been executed under my direction by the practised hand of Mr. Schmitson. The sources from which the new material was derived were the Heidelberger Frauenklinik and Poliklinik, the Pathological Institute, and the author's own practice. I am greatly indebted to the directors of those institutions, Drs. Arnold and Kehrer, and to their assistants, especially Professor Ernst.

In regard to the material from the Münchener Frauenklinik which was included in the first edition, I refer to the preface to that edition, and renew the expression of my grateful appreciation of the ready kindness with which my former respected chief and master, Dr. von Winckel, not only placed that clinical material at my disposition, but assisted me, besides, with his inestimable suggestions, which are still found in the corresponding passages in the text and in the illustrations.

In this revision I have been guided chiefly by the demands of the practical, clinical side of obstetrics, and it is for this reason that all scientific explanations and anatomic, histologic, and pathologic data are printed in a different type from that of the ordinary text. In this way I have fully preserved the peculiar character of an atlas accompanied by a complete abstract.

Every chapter has been carefully revised and the literature utilized. The advances made in the last few years have been considerable. Many questions have been brought nearer a final solution, many others have become more complicated, while new ones have made their appearance. Hence it was often necessary either simply to cite all the reported findings, or in other cases to add to them a personal interpretation. Chapters of this kind are those on the youngest ova, on the chorionic epithelium and syncytium, on the epitheliomata of the chorion and deciduomata, the nature of the "lower uterine segment" and the "contraction-ring," the treatment of ectopic gestation, hystereurysis and kolpeurysis, of reflex neuroses and anomalies of innervation, etc. In recognition of the general tendency to consider the body as a complete entity, I have thought it advisable to add a chapter on the mutual influences which the individual organs exert on one another, both from a physiologic and a pathologic point of view, and I have therefore attempted to build up a practical system on the basis of my own experience and of the literature bearing on the subject. An effort has been made to discuss the symptomatology with the greatest fulness compatible with brevity, instead of dismissing the subject with a few stereotyped phrases which are of no use in the individual case. In like manner, the indications for treatment have been made more complete and at the same time more definite.

Wherever it was possible, tables and schemes have been added so as to afford a general view of the subject under discussion. In conclusion, I must not omit to state that without the self-sacrificing coöperation of the publisher and the intelligence of Mr. A. Schmitson, such a large and complete collection of original drawings would not have been possible. I wish to express to these gentlemen my heartfelt thanks.

OSKAR SCHAEFFER.

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PART I.

PHYSIOLOGY AND DIETETICS OF PREGNANCY, LABOR, AND THE PUERPERIUM.

CHAPTER I.

PHYSIOLOGY AND DIAGNOSIS OF PREGNANCY.

Various Reasons for Determining the Existence of Pregnancy.—The physician may be called upon to determine the existence or non-existence of pregnancy for various reasons. His opinion is anxiously sought by those who fear the possible consequences of illicit indulgence, and even in lawful wedlock many contingencies arise which make it desirable or even indispensable to determine the existence of pregnancy and the date of its termination. The information is asked for as eagerly by the elderly couple, with an ardent desire for an heir after a long and sterile marriage, as by the anxious parents blessed with a large family but ill supplied with the necessaries of life, or by a husband solicitous for the health of his wife, whose constitution may be weakened by tuberculosis or other disease. The date of impregnation is often a matter of great importance, as, for instance, when a widow is called upon to prove the legitimacy of her child born after her husband's death; or for the purpose of calculating the probable time of delivery, so that it shall not conflict with a long sea-voyage or a change of residence; or, finally, in the case of a late arrival, to enab

FIG. 1. **Ovary with Ampulla of Tube.**—The fimbriated extremity o the tube, loosely held in place by the ovariopelvic fold of peritoneum, i attached to the broad ligament, although less firmly than the isthmu The gaping *morsus diaboli* is seen with a stalked hydatid hanging fro it; a small cyst is also seen on the *fimbria ovarica*. These structures ar present in four-fifths of all individuals and represent, when situated i the anterior layer of the broad ligament, the atrophic remains of the transverse tubules of the lower part of the Wolffian body; or they may be pedunculated fimbriæ covered with epithelium. The surface of the ovary is grayish-red and presents on its upper margin a structure of similar appearance, which is a Graafian follicle, while several deeper lying follicles can be made out by their bluish color shining through the tunica albuginea. The furrows represent the scars of follicles which have burst and been converted into *corpora fibrosa* or *candicantia*. The upper border of the ovary is covered by peritoneum, or rather embedded in a fold of the membrane; the boundary, known as Farre's line, can be seen in the figure (original water-color, natural size).

FIG. 2. **Ovary with Corpus Luteum** (original water-color, natural size) laid open; underneath, a cyst laid open, with myoma of the uterus. The follicle, which may attain the size of a pea, is ruptured by the internal pressure at the time of the menstrual congestion, the ovum escaping into the peritoneal cavity. The follicle then becomes filled with clotted blood and large cellular elements containing fat and a yellow pigment—the lutein-cells, derived from the follicular epithelium, or, according to others, from the granular cells of the internal tunic (*membrana granulosa*), and is then called a *corpus luteum*. It is often traversed by radiating connective-tissue septa, and the center is occupied by coagulated blood, which may persist a long time and contain hematoidin crystals.

FIG. 3. **Longitudinal Section of an Ovary** (original water-color, natural size), showing the *cortex*, in which *Graafian follicles* in various stages of development are embedded, and the *medulla*, richly supplied with blood-vessels. The outermost layer is formed by the fibrous *tunica albuginea*, covered with cuboidal epithelial cells.

---

reliable" signs of pregnancy must be learned by constant practice, and the search for them should never be neglected. If the physician has had an opportunity of examining the patient before she became pregnant the diagnosis is, of course, much easier, as the size, position, and consistency of the unimpregnated uterus are known. During the first month the picture of a normally progressing pregnancy is obtained by comparing the changes observed at two successive examinations made at an interval of three to four weeks.

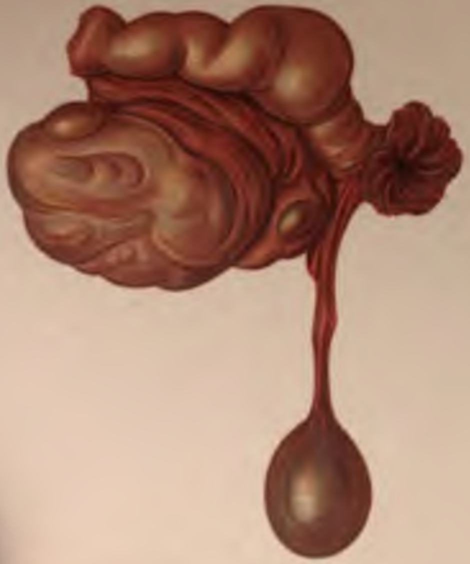

Fig. 1

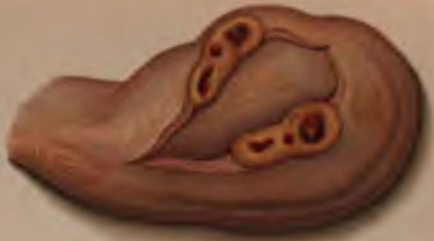

Fig. 2.

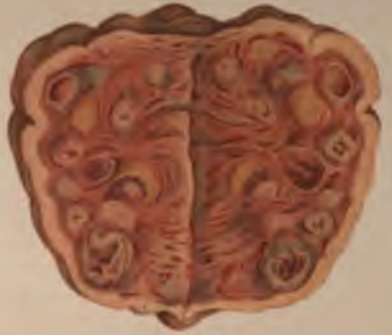

Fig. 3.

Lith. Anst. F. Reichhold, München.

These changes affect the shape, size, blood-supply, consistency, color, and specific functions of the organs.

§ 1. DEVELOPMENT OF THE OVUM. CHANGES OBSERVED IN THE ORGANS OF GESTATION DURING PREGNANCY.

The ovary, in which the ova are formed, is an almond-shaped organ, measuring from 1½ to 2 in. (3 to 5 cm.) in length, partially covered by a fold of peritoneum, the mesovarium, and embedded in the posterior layer of the broad ligament. It is attached to the uterus by means of the *ovarian ligament,* and to the Fallopian tube or oviduct by means of the fimbriæ, which are covered with ciliated epithelium and form part of the tubo-ovarian ligament. The pull of this ligament gives to the ampulla, which is freely movable, a downward curve, so as to bring its opening, the *morsus diaboli* or *ostium abdominale*, nearer the ovary. The free portion of the tubo-ovarian ligament, together with the curved tubal portion of the broad ligament, with which it is continuous, forms a tent-like covering for the ovary—the *ovarian sac* (*bursa ovarii*).

The ovary is usually found below the pelvic inlet, in a sagittal plane midway between the superior spine of the ilium and the symphysis, corresponding in height and direction to the iliopectineal line at its center (Waldeyer), and embedded in the posterior portion of the obturator fossa. It is surrounded by the ureter, the internal iliac, and uterine arteries, and lies within the *fossa ovarii*, which occupies the posterior part of the lateral wall of the pelvis near the margin of the sacrum. At this point it is attached by the suspensory ligament of the ovary, the *infundibulopelvic band*, which transmits the ovarian vessels. The vermiform appendix usually descends as far as this region, being sometimes connected with the oviduct by a narrow fold of peritoneum, the *plica ovarico-enterica.*

The surface of the ovary (Figs. 4 and 5) is covered with a single layer of cuboidal epithelial cells, derived from the same source as the large endothelial cells of the peritoneal covering, although there is a distinct boundary-line between them. In the third

[illegible]

tion of Pflüger's cell cords, show
and germinal spot : 4, follicle in
containing one ovum : 7, one with
ova ; 8, fully matured Graafian fol
membrana granulosa, discus prolig
seen pushing the surface of the ovar
ovum. The other spaces, lined w
represent follicles in which the ov
the section. 10, blood-vessels, lymph
from the broad ligament in company
tive tissue.

FIG. 6. **Cross-sections of an Ovid**
ing from author's specimen : *a*, nea
muscle-fibers, the mucosa has few pa
papillæ in mucosa ; *c*, near the amp
in papillæ ; 1, peritoneal endoth
with blood-vessels (4) ; 3, muscula
ciliated epithelium.

FIG. 7. **Cross-section through the Isth**
original drawing from author's spec
connective tissue containing nume
with markedly dilated vessels, as at
appears in oblique section : 5, col
stroma, forms the characteristic pap

month of fetal life this germinal
to proliferate, and dips down
stroma of the cortex in the for
traversing the thickened outer lay
albuginea. Th

follicular epithelium the zona pellucida, and later, the *discus oligerus*, are formed, within which, situated near one pole, the ature ovum is formed. The ovum [illegible] consists of the radially iated *zona pellucida*, yolk, germinal vesicle, and germinal spot, tangled in the meshes of [illegible]-fibers. Inside the *zona nulosa* the [illegible] is surrounded by the [illegible] *folliculi*, ich separates it from the wall of the follicle. The follicle is vered by a layer of greater density, the *theca folliculi* or *tunica pria et fibrosa*). Nerves have been found in the *discus proligerus*, ganglion-cells have as yet been demonstrated in the ovary Herff).

The center of the ovary is occupied by the medulla, the stroma which is richly supplied with blood-vessels and nerves derived m the intraligamentary connective tissue.

OVULATION AND MENSTRUATION.

The ovaries are at all times filled with ova in various ges of development. An overdistended Graafian folli e bursts and an ovum is discharged. Two or more llicles may rupture at the same time and give rise to a in or multiple pregnancy, or the fecundation of more an one ovum. The overdistention and rupture of a raafian follicle are caused by an increase in the blood-essure within the ovary, which occurs at intervals of ree to four weeks, hence, under normal conditions, the ape of the ovum into the peritoneal cavity recurs at gular periods coincident with the time of greatest blood-essure. The pressure begins to rise about the middle the intermenstrual period, hence, even at this time, any idental congestion of the generative organs may bring out the distention and rupture of a follicle. It has been oven by postmortem studies on pregnant women who d died of heart disease, that this periodical determina-n to the generative organs continues during pregnancy; e rupture of a follicle during this period is, therefore, ssible, and explains the occurrence of superfecundation impregnation of an ovum after the development of an ibryo has begun, and even of superfetation (after the th week).[1]

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[1] This is denied by most American authorities; see Piersol, in *American t-Book of Obstetrics*, p. 144. Trans.

FIG. 4. **Transverse Section of Ovary from a Four-months' Fetus** (microscopical: original drawing from author's specimen).—Explanation of numbers as in Fig. 5.

FIG. 5. **Longitudinal Section through the Ovary of a New-born Infant, showing a Mature Follicle** (microscopical; original drawing from author's specimen): 1, sharply outlined endothelial cells at hilum, merging into 2, cuboidal germinal epithelium; 3, an ovum embedded in the follicular epithelium, which is derived from germinal epithelium by proliferation of Pflüger's cell-cords, showing *zona pellucida*, yolk, germinal vesicle, and germinal spot; 4, follicle lined with a single layer of epithelium and containing one ovum; 7, one with two ova; 5, capillaries; 6, primitive ova; 8, fully matured Graafian follicle, showing the fibrous *theca folliculi*, *membrana granulosa*, *discus proligerus*, ovum, and *liquor folliculi*, which is seen pushing the surface of the ovary upward; 9, immature follicle with ovum. The other spaces, lined with a single layer of cuboidal cells, represent follicles in which the ovum did not happen to be included in the section. 10, blood-vessels, lymphatics, and nerves entering the hilum from the broad ligament in company with the intraligamentary connective tissue.

FIG. 6. **Cross-sections of an Oviduct** (microscopical; original drawing from author's specimen): *a*, near the *ostium internum*, which is rich in muscle-fibers, the mucosa has few papillæ; *b*, through the isthmus, four papillæ in mucosa; *c*, near the ampulla, poor in muscle-fibers, but rich in papillæ; 1, peritoneal endothelium; 2, subserous connective tissue with blood-vessels (4); 3, muscularis, essentially circular in shape; 5, ciliated epithelium.

FIG. 7. **Cross-section through the Isthmus of a Gravida** (microscopical; original drawing from author's specimen): 1, endothelium; 2, subserous connective tissue containing numerous blood-vessels; 3, muscular coat with markedly dilated vessels, as at 4, for instance, where the vessel appears in oblique section; 5, columnar epithelium which, with the stroma, forms the characteristic papillæ appearing in the fifth month.

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month of fetal life this germinal epithelium, as it is called, begins to proliferate, and dips down into the loose connective-tissue stroma of the cortex in the form of Pflüger's cell-cords, after traversing the thickened outer layer of stroma known as the *tunica albuginea*. The ova develop within the true ovarian stroma. In their primitive stage they appear among the cuboidal epithelial cells as large cellular elements with a nucleus and nucleolus, later as globular masses, consisting of germinal epithelium and several primitive ova, pushing their way into the stroma. From these masses are formed the primary follicles in which each ovule has separated from the mass and become surrounded by small epithelial cells derived from the walls of the follicle. The latter finally develops into the mature Graafian follicle. By proliferation of

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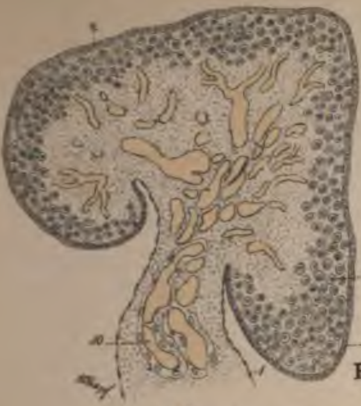

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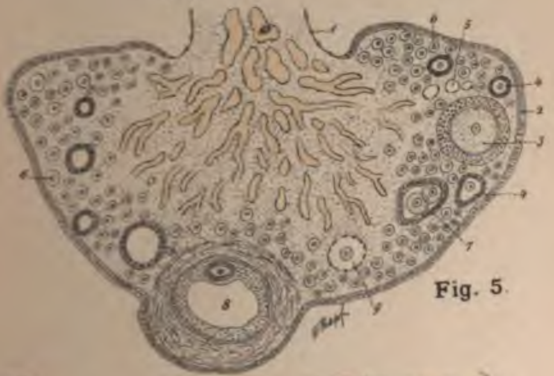

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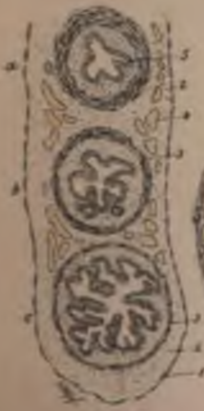

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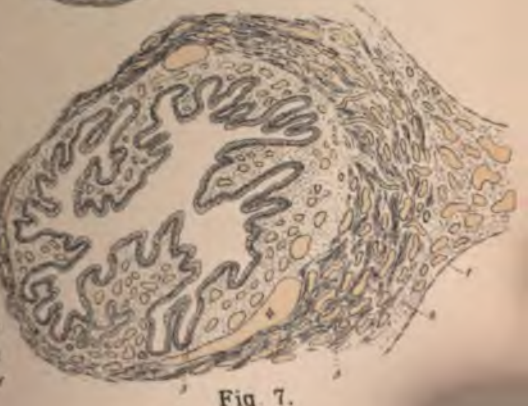

Fig. 7.

Lith. Anst. F. Reichl

The escape of the ovum from the ovary is termed *ovulation;* while the regularly recurring determination of blood to the generative organs has received the name of *menstruation*, because it occurs usually at intervals of about four weeks. Both processes are evidently under the control of a central regulating apparatus; for, although the local hemorrhage from the genitalia is the most conspicuous pathological feature, the entire organism not only during the three or four days of the catamenial period but also during the entire space of four weeks is subjected to fluctuations in blood-pressure, metabolism, and innervation, culminating in the establishment of the menstrual flow. Thus the determination to the generative organs is a gradual process, starting about the middle of the intermenstrual period and culminating in a local hemorrhage from the congested mucous membrane of the uterus. If the escaping ovum is not fertilized, the congestion of the mucous membrane and the active regenerative processes in its epithelial and glandular structures subside, the parts return to their former condition, and the epithelium of the mucous membrane separates here and there in shreds over the site of submucous ecchymoses. This disintegrating process usually occupies about two weeks.

Metabolic activity is at its height shortly before the menstrual period, sinks as soon as the catamenial flow is established, and continues at its lowest during the three or four days of the menstrual period. The changes in the other generative organs are undoubtedly dominated by the ovarian process; without the latter there can be no menstruation. Artificial congestion of the ovaries by injection is followed by hyperemia of the uterine mucous membrane (Strassmann).

The ovaries can be transplanted in the same animal to other portions of the peritoneal cavity without suffering any impairment of function; they continue to share in the congestion of the uterus, and may even inaugurate a normal pregnancy (Knauer).

On the other hand, if both ovaries are removed the uterus undergoes atrophy and the blood-vessels degenerate, the epithelial and glandular portions of the mucous membrane being first affected. The ovaries also undergo retrograde metamorphosis after extirpation of the uterus.

In a sense the ruptured follicles also share in the menstrual hemorrhage. If impregnation has occurred the hemorrhage within the follicle is more marked and the ovaries become enlarged and succulent. After the escape of the ovum the cells lining the inner surface of the follicle (follicular epithelium or the granular cells of the internal tunic) undergo proliferation and fatty change, there is an invasion of round cells, and a yellow body, the *corpus luteum* (*verum*), is formed.

The wall of the follicle separates in folds, hematoidin-crystals are deposited, the entire mass becomes organized, and the proliferation of connective tissue forms a scar—*corpus fibrosum s. candidans.* The *corpora lutea* appear to be concerned with the maintenance of normal circulation and blood-pressure within the ovary.

Tubal menstruation may occur in certain pathological conditions.

FERTILIZATION AND PROPULSION OF THE FERTILIZED OVUM ALONG THE OVIDUCT.

When the ovum reaches the peritoneal cavity it is carried toward the pavilion of the oviduct partly by the ciliary movement of the fimbriæ and partly by the current of the thin layer of serous fluid which normally covers the entire peritoneum. This current is produced by a sucking action emanating from the ampulla, the mucous membrane of which is free from glands and consists of a substratum of longitudinal bundles of connective tissue containing numerous round cells, surmounted by a layer of short ciliated columnar cells, which generate a ciliary current toward the narrow *ostium internum.* The same current effects the removal of a non-impregnated ovum. If fecundation has occurred, the muscular fibers of the tube also assist in the propulsion of the ovum. It is possible for an ovum to find its way into the

FIG. 8. **Embryo from an Abortion at the End of the Second Month** (original water-color, natural size).—The decidua shows numerous extravasations; the chorion, which is held up and expanded, is detached in places. Through the opening a view of the interior of the amniotic sac is obtained, showing the umbilical cord and several subamniotic hematomata. The ovum must have been ruptured during labor and the embryo expelled with the amniotic fluid, unless, as happens frequently in early abortions, the embryo died first and was absorbed.

tube either by external or intraperitoneal or, in rare cases, by internal uterine transmigration.

It follows from the foregoing description that the oviduct may be divided into two segments: the *uterine isthmus* with a very narrow lumen, lined with smooth mucous membrane, but possessing a robust muscular layer, and the *ampulla*, of a much larger caliber and provided with a thickly corrugated mucous membrane. From the folds of this membrane are formed the *morsus diaboli* and the fimbriæ which surround the *ostium abdominale*. The fimbriæ begin to appear in the third or fourth month of fetal life. At this time the extremities of the tubes are partly united with the surface of the ovary, forming the so-called ovarian tubes, which occasionally persist and may give rise to a tubo-ovarian gestation.

In transverse sections the lumen of the tube presents a stellate outline (Figs. 6 and 7). At the uterine extremity there are three papillary projections; in the intermediate portion four primary and several secondary papillæ, the former appearing as early as the fifth month and containing numerous unstriated muscle-fibers, while the entire lumen of the ampulla is filled with richly branched processes. There are no actual mucous glands, but in health the surface is constantly bathed with a small amount of mucus secreted by the cells of the mucous membrane.

The *muscularis mucosæ* is composed of a robust median zone of circular, and a lesser external zone of longitudinal, fibers. The tube is covered with peritoneum for three-fourths of its circumference, the remaining fourth corresponding to the hilum. The latter is formed by intraligamentary connective tissue which contains the blood-vessels and surrounds the entire tube under the peritoneal covering.

Impregnation may occur at any point in the oviduct. By virtue of their ciliary movement the spermatic filaments are able to reach the fundus uteri within a few hours, and they retain their vitality a week or more after coitus, in the uterus, in the tubes, or even on the peri-

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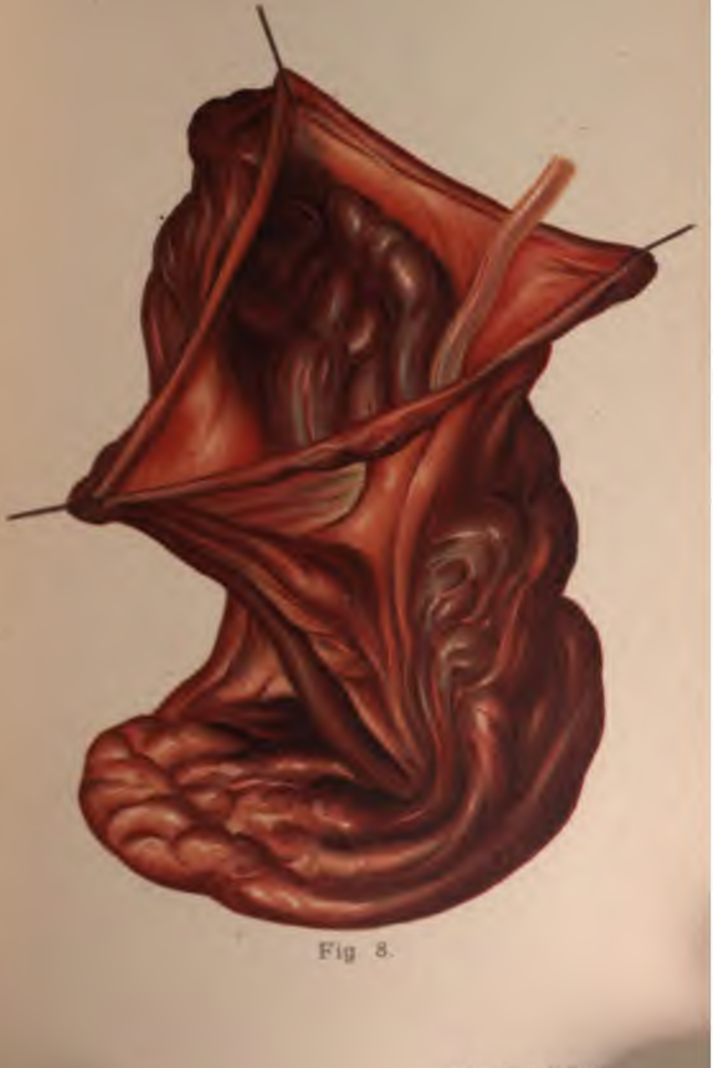

Fig. 8.

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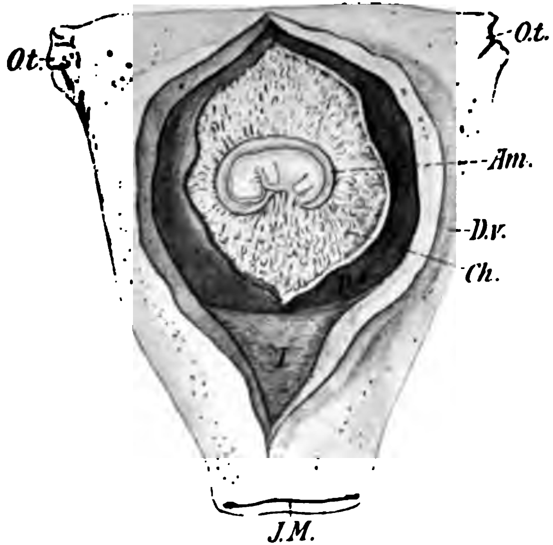

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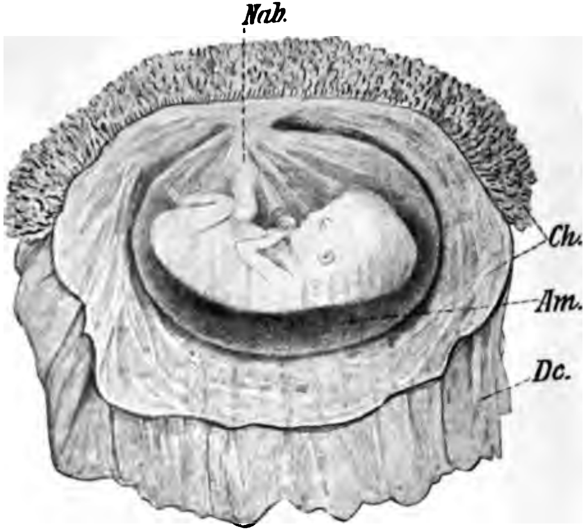

Fig. 13.

FIG. 9. **Chorion and Amniotic Sac with Ovum, between the Second and Third Month** (original water-color).—The chorion (*frondosum*), which at this period still surrounds the entire ovum, is laid open, showing the interior of the amniotic sac and the head of the embryo.

FIG. 10. **Decidua Vera** (original water-color, see Fig. 8).—A portion of it is still intact and covered with blood-clots. Compare these true fetal membranes with:

FIG. 11, which represents spurious fetal remains, consisting of fibrin and blood-clots.

FIG. 12. **Complete Ovum in the Second Month** (original drawing from a specimen obtained at the Münich Gynecological Clinic).—The "window" in the *decidua vera* reproduces the triangular shape of the uterus; *J. M.*, os uteri; *o. t.*, openings of the oviducts. We see the *decidua reflexa* (*D.c.*), the *chorion* (*Ch*), and within the *amnion* (*Am*) the embryo (brain-vesicles, visceral arches, four extremities, prominence of cardiac and hepatic regions, and the caudal extremity with the long coccygeal point).

FIG. 13. **Ovum of the Third Month** (original drawing).—We see *decidua reflexa* (*D.c.*), the chorion (*Ch*) laid open, and the amnion (*Am*) closed. The fetus is suspended by the umbilical cord (*Nab.*), which is seen through the membranes. The head is large in comparison with the body.

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ous *villi*, consisting principally of ectodermic cell-cords which bind it firmly to the amnion. It is further attached to the embryo by means of an abdominal stalk, the future umbilical cord. Through this structure the embryo obtains its nutriment by means of vessels which at first derive their material from the vitelline circulation (*arteriæ et venæ omphalomesaraicæ*), as they form a network around the vitelline sac. The remains of this structure are sometimes found at birth as a minute, flat, yellowish mass not far from the insertion of the cord into the placenta, along one of the folds of the amnion (B. S. Schultze). About the middle of the first month the *allantoic sac* makes its appearance at the caudal pole of the embryo, growing from the region of the hind-gut and urachus. It contains the umbilical vessels which dip down into the branching ectodermic blood-islands of the chorion. The umbilical cord breaks up into the countless chorionic villi of the placenta. The latter push their way into the uterine mucous membrane, which is denuded of its epithelial

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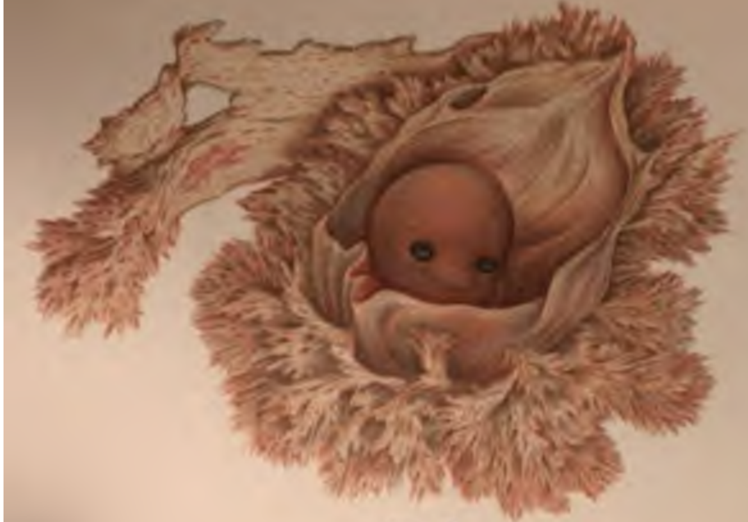
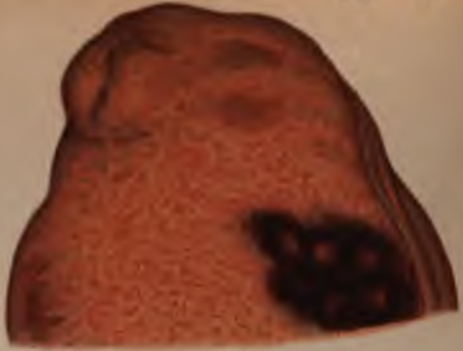


Fig. 9.



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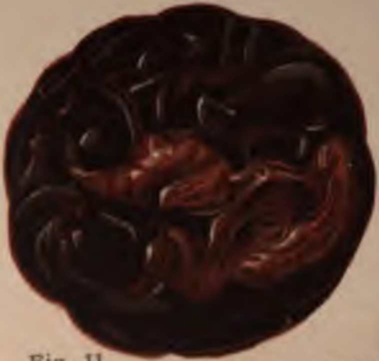

Fig. 11.

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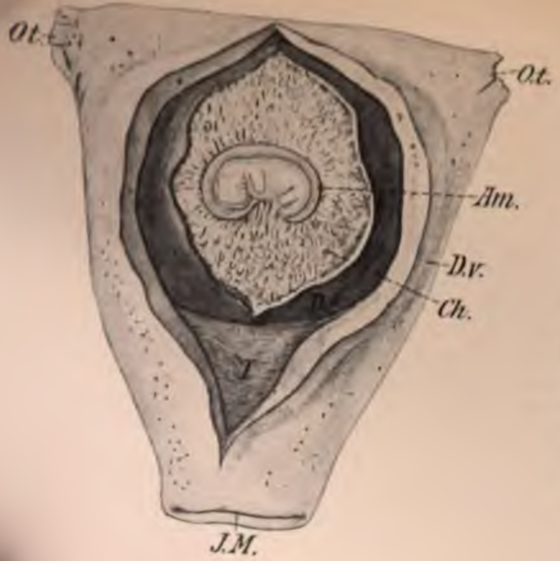

Fig. 12.

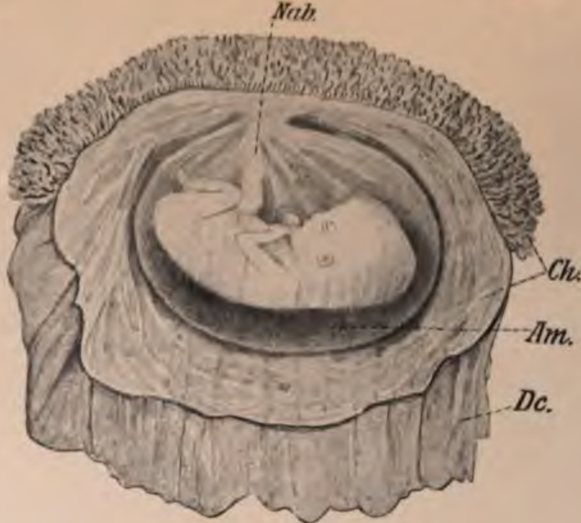

Fig. 13.

and even moderate contractions may compress them to a considerable extent. Muscular contractions may be vigorous enough to cut off the supply of blood, and, therefore, of oxygen to the fetus; while, on the other hand, they may be utilized as a means of stopping an uncontrollable hemorrhage.

Anatomically the *uterus* is naturally divided into two parts: the *body*, which in the virgin state is flattened and about the size and shape of a pear; and the cylindrical *cervix*, narrower than the body, the conical extremity of which projects into the vagina, and thus justifies the name *portio vaginalis.*

The cervical canal communicates with the vagina by means of the *external os.* Its chief function is the secretion of alkaline mucus, which has *marked bactericidal qualities* and serves to lubricate the vagina. It is possible that the mucous plug which occludes the cervix may in some way facilitate impregnation. The intermediate portion of the cervical canal is somewhat dilated and contains the *plicæ palmatæ* (*arbor vitæ*), which in the fetal uterus form obliquely placed valves similar to those observed in the sheep.

The columnar epithelial cells secrete mucus and are accordingly very well developed. The club-shaped cells of the cervix are the best developed of any in the body; the lower protoplasmic portion containing the nucleus elaborates the mucus, which is stored for use in the upper portion of the cell. The cells are provided with cilia which generate a current directed from the fundus to the cervical canal (Hofmeier, Mandl). The shape of the cells is strongly influenced by external conditions. Between the cells are preformed intercellular spaces traversed by delicate fibrils of protoplasm.

The cervical canal communicates with the cavity of the uterus by means of the narrow and sensitive *internal os*, which is occasionally closed by *valves* directed toward the fundus, the remains of infantile structures. Under normal conditions the ovum is attached *above* the internal os, hence the uterine cavity represents the specialized segment destined for the *reception and development of the ovum.* The mucous membrane of the corpus uteri only becomes converted into the decidua, and the menstrual hemorrhage is

FIG. 17. **Rare Vertical Position of the Gravid Uterus in the Third Month, following a Retroversion** (original drawing).—Sagittal section through the median line of the pelvis. The ovum does not extend below the body of the uterus; the cervical canal and both the internal and the external os are closed. The external os is directed downward and backward, and descends lower than is the case in the virgin uterus and in a normally placed uterus. The gravid body of the uterus has lost its flattened, pyriform shape, is more balloon-shaped, with the greatest enlargement in the sagittal plane. The envelope, consisting of decidua and chorion, is still fairly uniform, but is beginning to show a local thickening at the future site of the placenta, where the umbilical cord is inserted. The uterus is still within the true pelvis; between it and the abdominal wall there is room for intestines and omentum; above the internal sphincter the rectum, or rather the sigmoid flexure, is seen greatly distended; the bladder is contracted.

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limited to this structure. In this portion of the generative canal the columnar cells are accordingly shorter and more regular in form.

The uterus requires a large blood-supply, which is derived from *two* sets of vessels wholly independent of each other, whose relations are well shown in Fig. 31.

Distribution and Relations of the Arteries of the Uterus (and of the Ureters). (Fig. 31): *Ur*, ureters; *R*, kidneys; *Ut*, uterus in anteversion, displaced forward to permit a view of Douglas' pouch; the rectum and peritoneum have been removed; *T*, tubes; *Ov*, ovaries; *Co*, cervix; *Lg. r.*, round ligament, running from the insertions of the tubes into the fundus along the bladder to the inner portion of the groin (dissected out from the broad ligament). Within the connective tissue of the triangular-shaped *broad ligaments* we see on either side the *large uterine arteries*, coming from the region of the hypogastric arteries and the pelvic walls and passing down by the side of the uterus to the cervix, giving off branches to the vagina and to the vulva. A small branch goes directly to the cervix, or the latter may be supplied by the uterine artery itself on its return toward the fundus after passing below the internal os. The branches form a tortuous network which is quite characteristic and persists after impregnation has occurred, thus enabling the vessels to accommodate themselves to the changes in volume incident to pregnancy. They run first in the subperitoneal tissue (see Fig. 14), thence they radiate into the mucosa after forming an intermediate zone of ramifications in the muscular coat for the supply of the latter.

Along the upper border of the uterus the uterine arteries form a free anastomosis with the *ovarian arteries*, resulting in a subperi-

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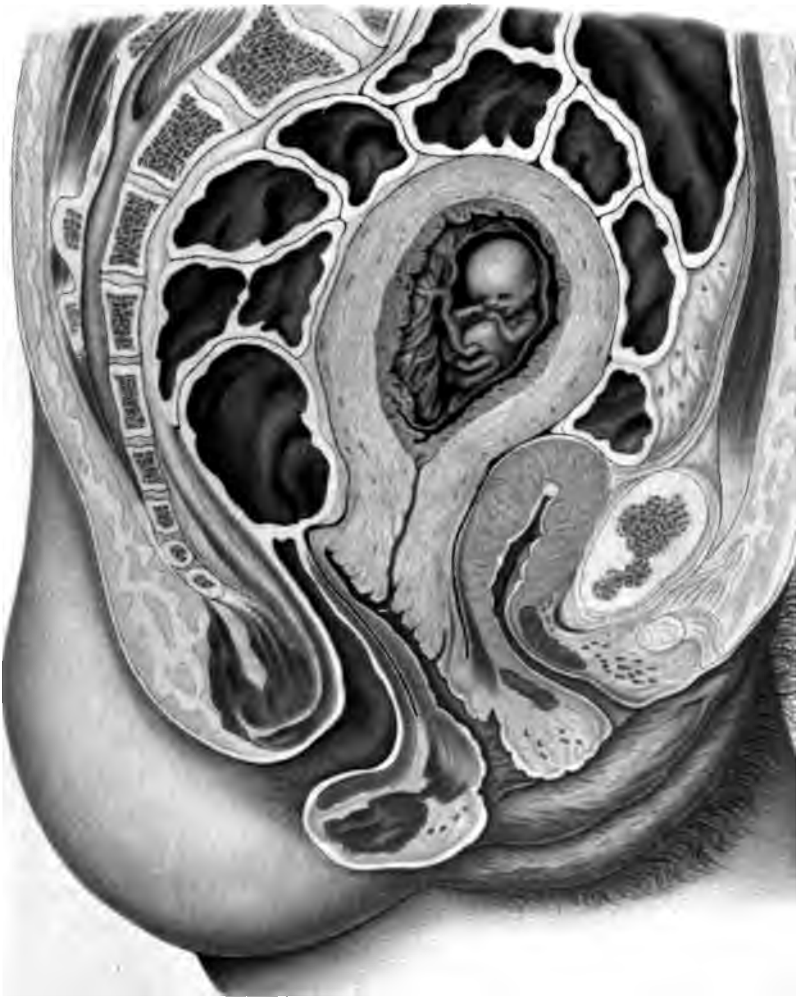

Fig. 17

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FIG. 18. **Retroverted Uterus in the Second Month of Gestation** (after a frozen section by Braune).—As the cervix is forced upward and forward by the increasing retroflexion of the body, there is danger of incarceration under the curve of the sacrum as pregnancy progresses. The neck of the bladder may be pressed upon and distorted to such a degree as to cause dangerous ischuria.

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yet been definitely settled; it is probably derived from the embryo (trophoblast). In very young ova the syncytium is represented by a single layer of cuboidal cells derived from the ectoderm, but later it forms a continuous band of protoplasm with nuclei embedded in it here and there, covering the vascular *embryonal mucous connective tissue* of mesodermic origin. The various embryonal and maternal tissues also combine to form conglomerate masses of cells.

This close relation between the chorion and the decidua, as here described, does not, however, persist along the entire periphery. In the course of the first three months the villi in contact with the decidua reflexa and the membrane itself cease to grow and even undergo marked atrophy, while at the place where the chorion comes into direct relation with the decidua vera its connection becomes more and more intimate and voluminous, and finally culminates in the formation of the *placenta serotina*. A part of the decidua reflexa sometimes retains its placental character, and thus gives rise to the formation of the *placenta circumvallata*. The fourth month witnesses the completion of the *true placenta*, a flat, cushion-like disk ("cake"), closely adherent to the anterior or posterior wall of the uterus (rarely to both, by passing over one margin or over the fundus), from which the true *fetal envelopes*, now reduced to thin membranes, proceed to enclose the fetus and the umbilical cord within the *amniotic sac.*

The *nutrition and oxygenation of the fetus* is effected by means of an interchange of gases and the passage, by osmosis, of fluids and watery solutions and even of formed elements. [The passage of oxygen was proven by Zweifel's

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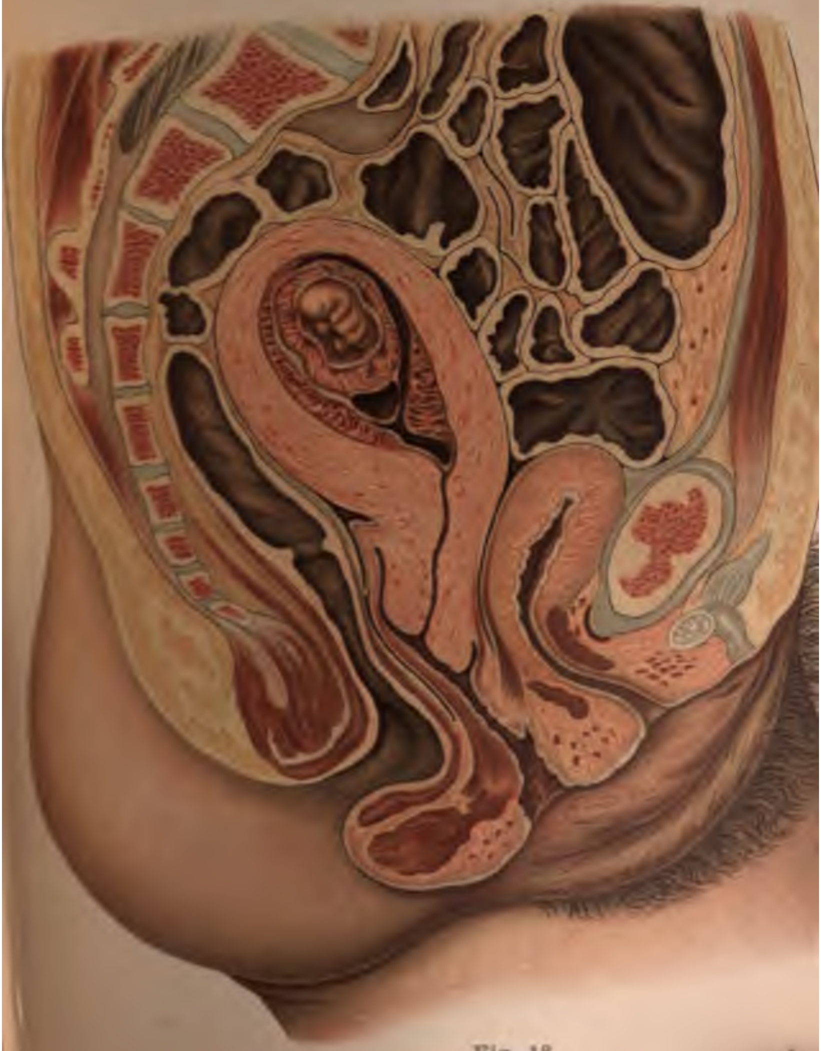

Fig. 18.

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FIG. 19. **Gravid Uterus in the Fourth Month in a Primigravida.**—The uterus is flabby and bulges in various places. The intestines have been pushed away from the abdominal wall and the fundus projects above the symphysis. A portion of omentum is seen interposed between the womb and the abdominal wall. The fetus possesses considerable mobility until after the middle of gestation, hence the position of the head in the fundus; in other words, the breech presentation is nothing unusual. At this time the true placenta is fully developed. The fetal membranes cover the internal os. The anterior and posterior walls of Douglas' pouch appear as two narrow clefts along the bladder and rectum respectively; posteriorly the subserous lamina is seen extending deeply into the rectovaginal septum. The vagina is narrow and the rugæ are well marked; the perineum is intact; the external os is closed—all signs of a first pregnancy.

FIG. 20. **Gravid Uterus in the Sixth Month in a Primigravida.**—The fundus extends almost to the umbilicus. Note the usual *attitude* of the fetus (about one-third natural size), huddled together, with head and extremities flexed.

is best felt by inserting the forefinger into the rectum and the thumb into the vagina against the portio vaginalis, while the womb is pressed down from above with the other hand.

The *ovum* is the size of a goose-egg (Fig. 13).

The *fetus* measures 3⅝ in. (9 cm.) and weighs 308 gr. (20 gm.); the head is half as large as the trunk; the umbilical cord is longer than the fetus and begins to show twisting.

End of the Fourth Month.—The *uterus* is as large as a man's head and palpable above the symphysis; the true pelvis is entirely filled. Parts of the fetal body can be recognized by their increased resistance (first reliable sign). It is possible to hear the *uterine bruit* synchronous with the maternal pulse, a faint breath-like sound emanating from the arteries.

The *fetus* measures 4 to 6¾ in. (10 to 17 cm.) and weighs 1 to 4¼ oz. (30 to 120 gm.). The sex can be recognized by the external genitalia. If born "prematurely" (not "viable") the child makes respiratory movements (see Fig. 19).

End of the Fifth Month.—The *fundus is midway*

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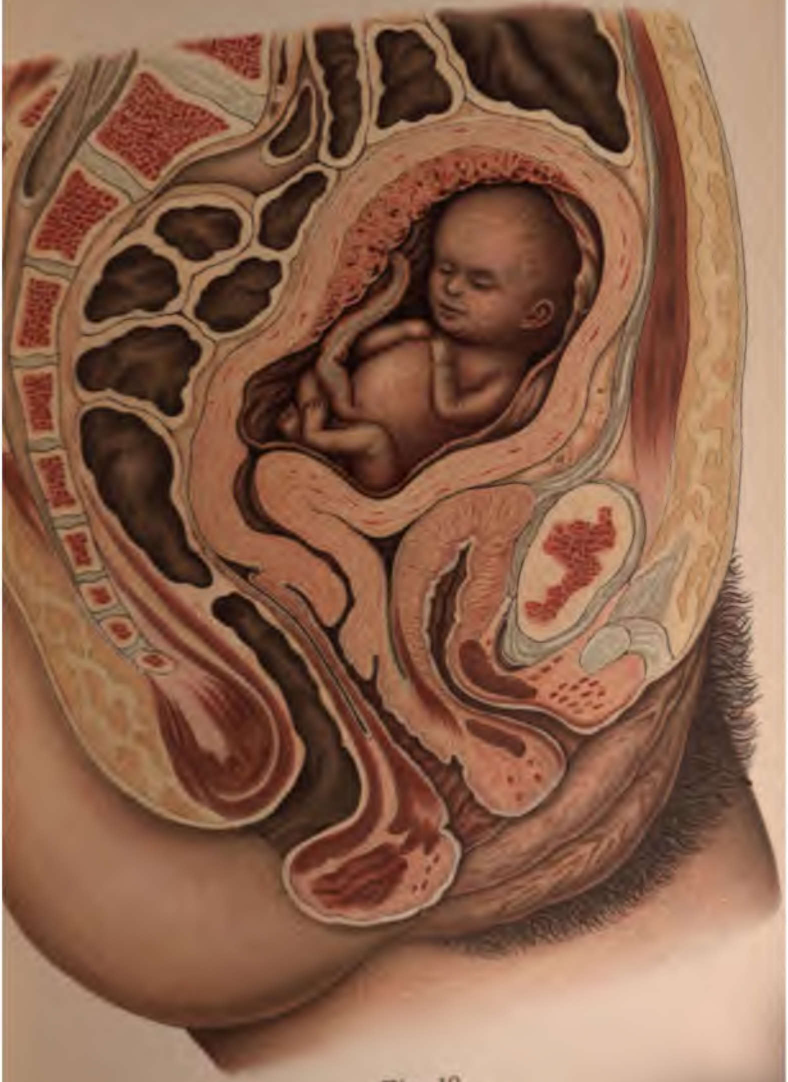

Fig. 19.

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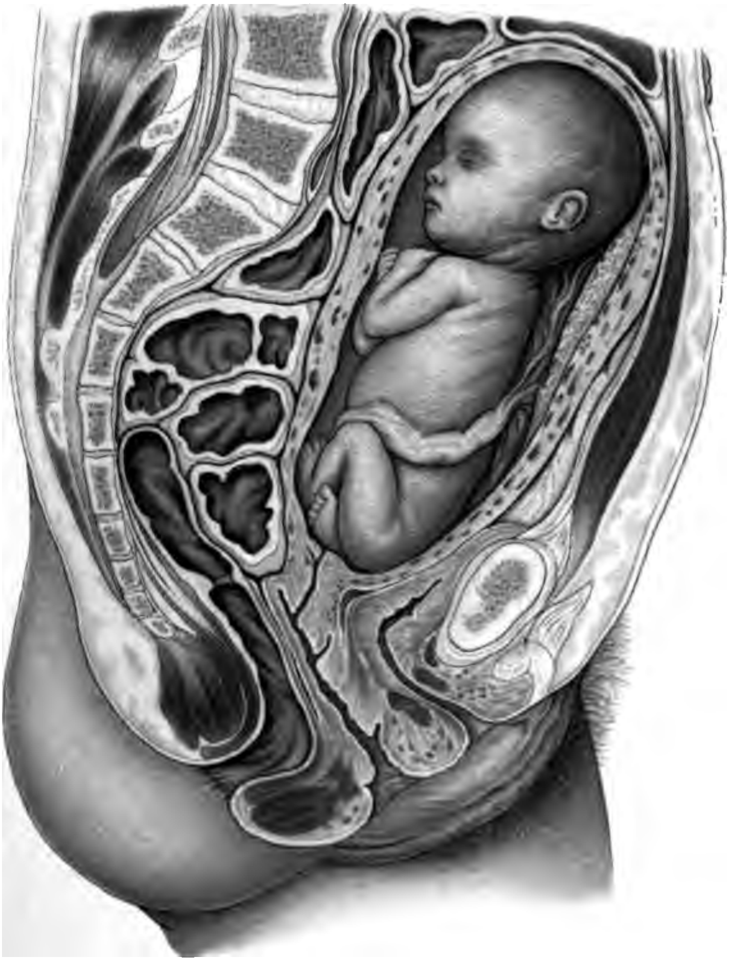

between the symphysis and the umbilicus, its transverse diameter coinciding usually with the right oblique diameter of the pelvis (from the *right* sacro-iliac junction to the opposite iliopectineal eminence). In multigravidæ the external os is sufficiently relaxed to admit the examining finger. Striæ and pigmentation appear on the abdomen (along the *linea alba*) and breast, forming in the latter situation the secondary areola.

The *fetus* measures 8 to 10 in. (20 to 25 cm.) and weighs 5 to 12½ oz. (140 to 350 gm.). *Fetal heart-sounds* begin to be audible from the eighteenth to the thirtieth week, and about the same time *fetal movements can be both felt and heard; later they can also be seen.*

End of the Sixth Month.—The *fundus* extends to within 1¼ to 1½ in. (3 to 4 cm.) of the umbilicus; the latter begins to become shallow from below. The uterus gradually assumes a more oval shape and thus determines the longitudinal position of the fetus. Softening of the cervix extends to a point above its middle. The portio vaginalis is on a level with the spine of the ischium, but appears shorter on account of the fold formed by the hypertrophied vagina. The mother inclines the upper part of the body slightly backward in walking.

The *fetus* measures 10½ to 13½ in. (26 to 34 cm.) and weighs 15 to 33½ oz. (430 to 950 gm.); whimpers if born prematurely. Up to this month we speak of "immature birth"—*partus immaturus* (see Fig. 20).

End of the Seventh Month.—The *fundus* extends 1¼ to 1½ in. (3 to 4 cm.) above the umbilicus; the latter is flattened.

The *fetus* measures 14½ to 15 in. (36 to 38 cm.) and weighs 29 to 40½ oz. (820 to 1150 gm.); emits a wail if prematurely born; the skin is wrinkled and thickly covered with hair; the pupillary membrane begins to disappear. As a rule, a presenting part of the child (one of the poles of the longitudinal axis) can be felt per vaginam; the *parts of the fetal body are easily distinguished.*

FIG. 23. **Lateral Placenta Prævia, Sixth Month** (belonging to Pl. 12; original water-color).—We see the interlacing of the larger villi which serve for attachment with the smaller, delicate, branching villi and the decidua on the maternal surface. The lower, bleeding portion corresponds to the part detached during birth; below are the fetal envelopes.

FIG. 24. **Fetus from the Sixth Month** (two-thirds life size; belonging to Plate 11; original water-color), delivered in incomplete foot presentation.—The skin is wrinkled and red; the nails do not reach quite to the tips of the fingers; the cord is edematous and gelatinous.

FIG. 25. **Complete Ovum from the Sixth Month** (original drawing): *Pl*, placenta serotina; *Ch*, chorion; *Am*, amnion, laid open. The cord passes over the shoulder and back (one-third life size). The fetus shows the characteristic attitude as described above (see Fig. 20).

End of the Eighth Month.—The *fundus is midway between the umbilicus and the epigastric fossa.* The secretion of the mammary glands makes its appearance. To preserve her equilibrium the woman is forced to lean over backward.

The *fetus* measures 16 to 17 in. (40 to 43 cm.) and weighs 46 to 57½ oz. (1300 to 1600 gm.); can be kept alive with great care. The arms are very fat and red; the skin is wrinkled (see Fig. 24).

End of the Ninth Month.—The *fundus is in the epigastric fossa, about 1¼ in. (3 cm.) below the ensiform process.* Toward the end of the month the *internal os* is *open* in *multiparæ*, the *external os*, in *primiparæ*. Greatest abdominal distention.

The *fetus* measures 18½ to 19¼ in. (46 to 48 cm.) and weighs 71 to 95 oz. (2000 to 2700 gm.). The head is less movable and has engaged in the pelvic inlet.

The *ovum* is still confined to the *uterine cavity* proper; the internal os now begins to expand, the parts having become softer and more distensible.

Tenth Month.—The *fundus* occupies the same position as in the eighth month and then usually sinks lower. Before the ovum begins to free itself from its attachments the *fundus falls to a point midway between the ensiform process and the umbilicus.* Its position varies, however, with the strength of the uterine contractions; the cause

Tab. 11.

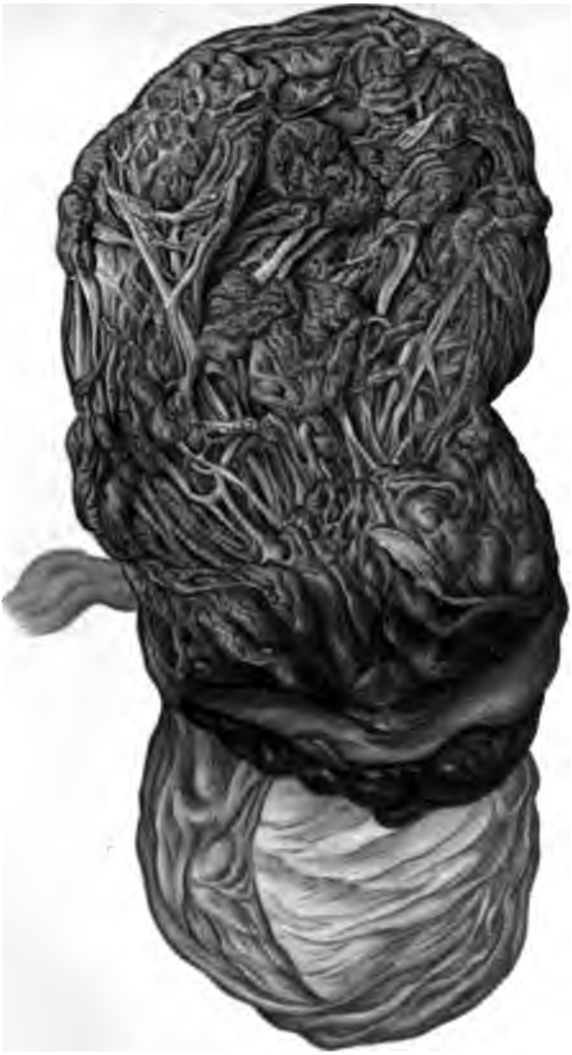

Fig 23

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Tab. 12

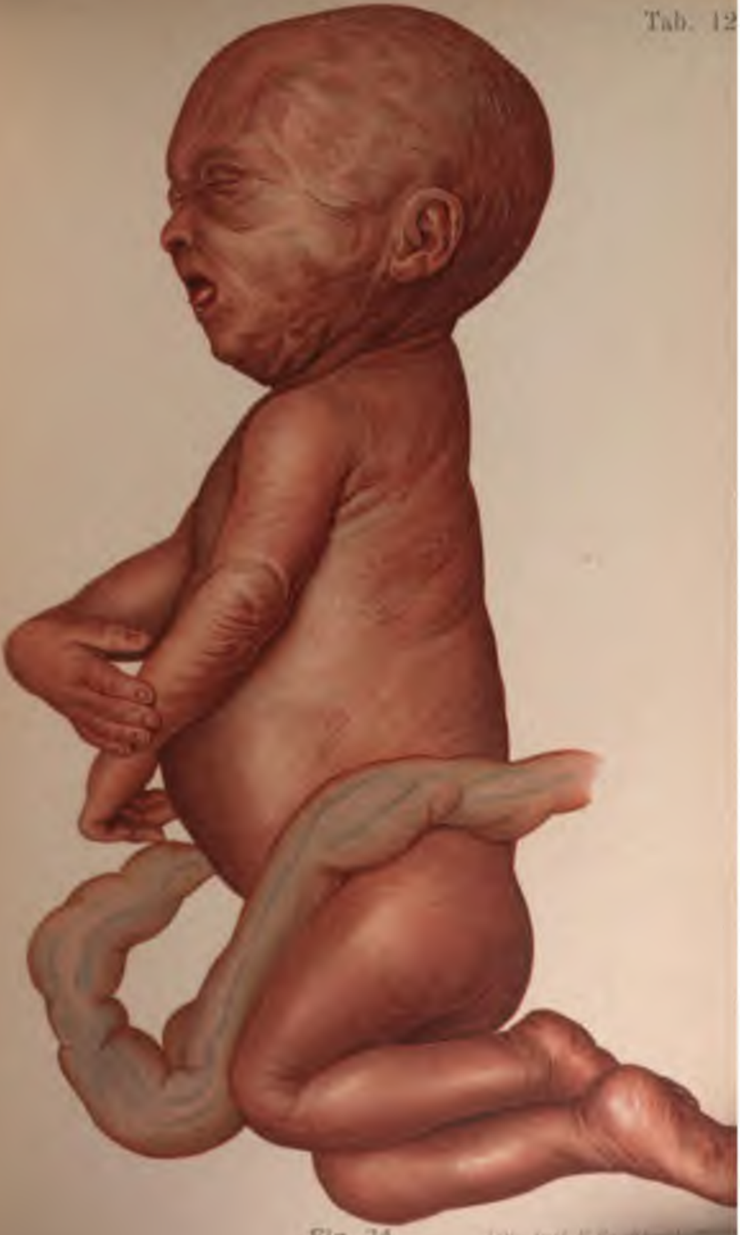

Fig. 24.

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Tab. 13.

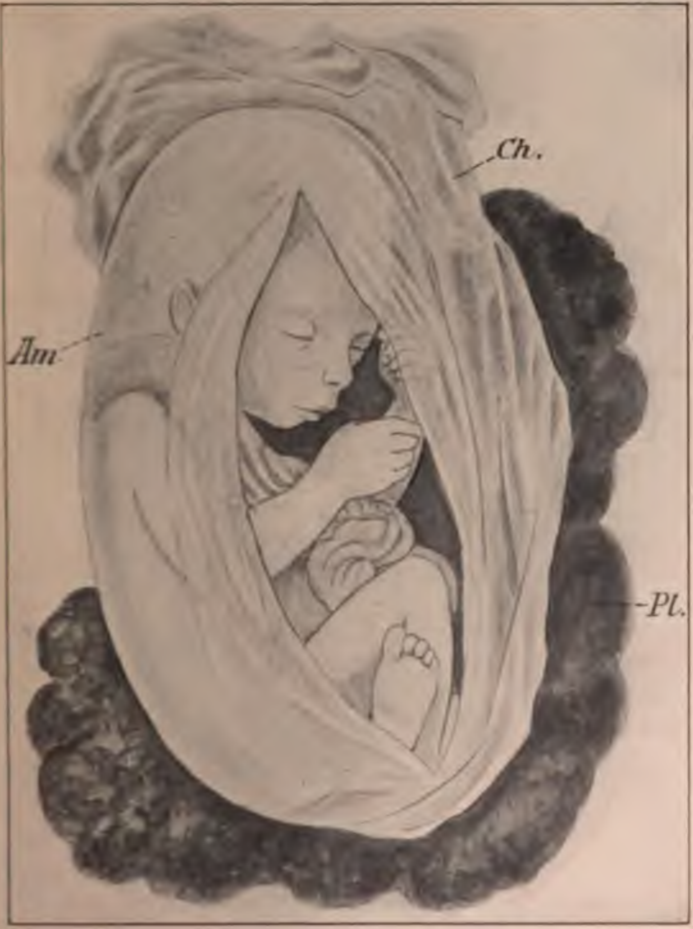

Fig. 25.

FIG. 26.—**Fetal Surface of the Placenta of an Immature Ovum in the Sixth Month** (original water-color).—The fetal membranes are stripped back over the margin in consequence of the placenta having been delivered in advance of the fetus. The fetal surface is recognized by the investing amniotic sac, under which are seen the large branching vessels of the placenta going to and coming from the umbilical cord. The branches of the umbilical vein are distinguished from the two arteries by their lighter color. In this specimen the umbilical cord is gelatinous and edematous; it contained four vessels, one of the arteries forming several loops.

FIG. 27. **Extrusion of the Placenta into the Cervical Canal** (*marginal placenta prævia;* original water-color made at the autopsy of a woman who died in the sixth month of pregnancy).—The umbilical cord projected from the os, and the ruptured membranes, with the margin of the placenta, were visible within the cervical canal, which is held open and expanded from side to side to afford a view of the uterine cavity. The greater part of the placenta, embracing the central portion and upper margin, still adheres to the uterine wall. The spot from which the protruding portion of the placenta detached itself is recognized by the clotted blood from the ruptured uteroplacental vessels. Numerous *ovula Nabothi* were observed about the margin of the external os.

FIG. 28. **Puerperal Uterus** from a woman who died of typhoid fever two days after a miscarriage in the fifth month (original water-color).—The placental site is easily recognized, as is the boundary between the uterine and cervical mucous membrane, which is clearly indicated by the difference in color. Analogous differences are found in the uterine wall; the upper limit of a "lower uterine segment," belonging to the body of the uterus and therefore beginning above the internal os, is indicated by a sudden thickening of the muscularis. Two *ovula Nabothi* are seen at the internal os, besides numerous similar bodies at the external os. The outer portion of the mucous membrane of the portio vaginalis, as well as that of the vagina, are anemic. The latter is the seat of several *icteroid cysts*, especially near the vaginal vault.

the month of pregnancy; 3, the position of the fetus; 4, the life or death of the fetus.

By *inspection* we determine the increase in the circumference of the abdomen, its shape—whether conical, pendulous, globular, or bulging in the two hypochondriac or hypogastric regions and flattened about the umbilicus—the presence of recent or old *striæ gravidarum;* pigmentation of the median line of the abdomen and its extent; the condition of the breasts—their tension, the presence of nodes and cords (determined by palpation)—

Tab. 14.

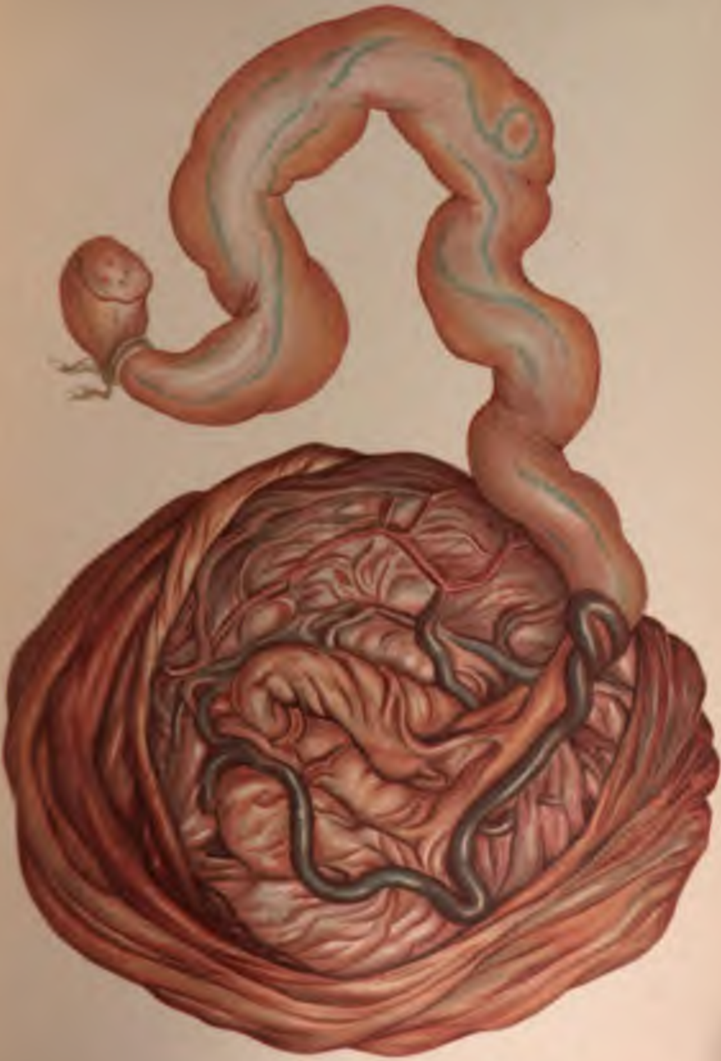

Fig. 26.

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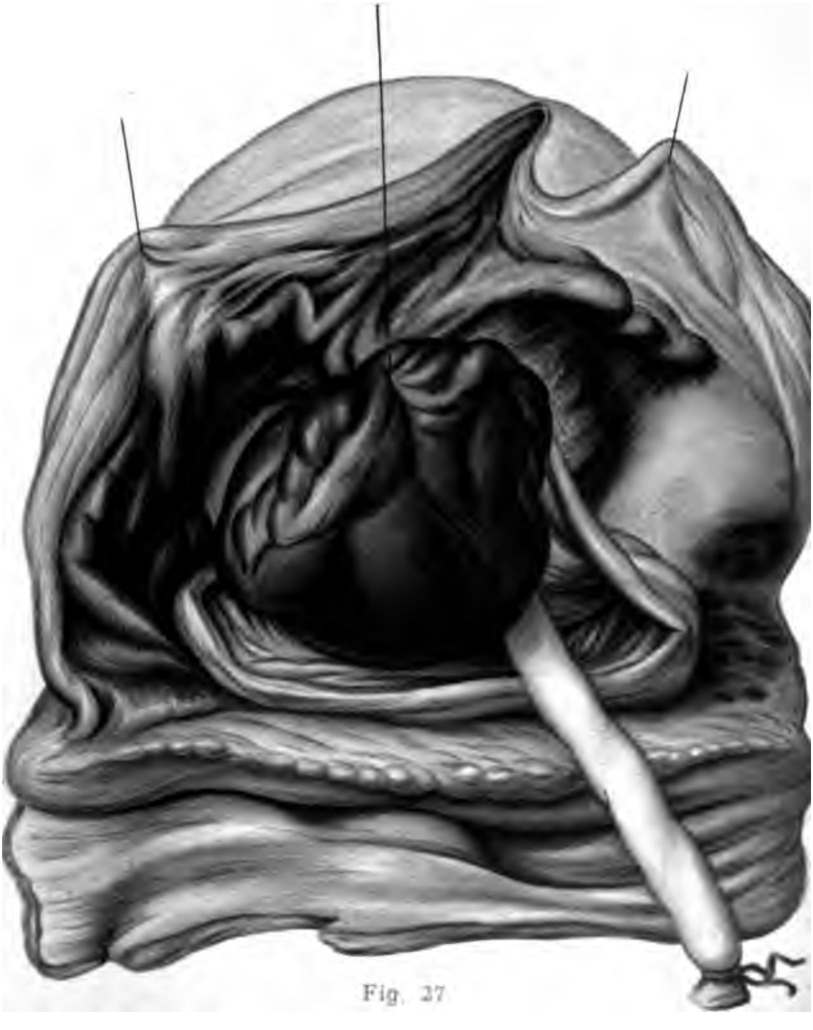
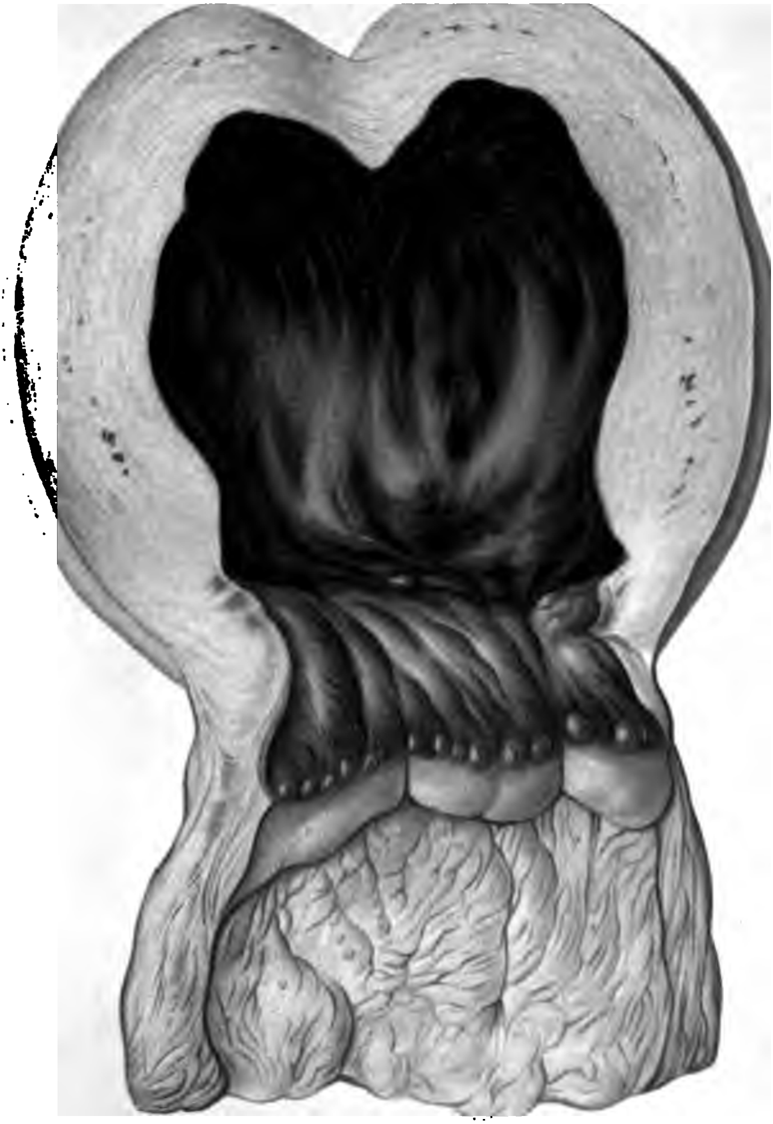


Fig. 37



the color of the areola. The patient is asked whether she has felt dragging and stabbing sensations and increased weight, and whether milk or a serous fluid can be expressed from the breasts.

In Figs. 34–36 four different positions of the hands in *palpation* are shown. By the *first method* (Fig. 34) the height of the fundus is determined; the *second* (Fig. 34) enables the physician to palpate the back and extremities of the child, and to detect fetal movements if any are made [back to the left, head below - first vertex presentation (L. O. A.); back to the right, second vertex presentation (R. O. A.]. The *third* and *fourth* methods are employed to locate the fetal head, whether it is felt as a hard, round mass, more or less movable above the pelvic inlet, or has already entered the pelvis, remembering the differences between a primipara and multipara in this respect. They also enable the examiner to form an approximate estimate of the child's length, which is often very desirable, as it affords a clue to the child's age and to the size of the head in proportion to a contracted pelvis. It is found by experience that the distance from the head to the coccyx, when the fetus is bent on itself, is equal to half the length of the body. This measurement is most easily made in oblique positions of the fetus.

The results of palpation are confirmed by *auscultation.* We can hear the soft, blowing *uterine bruit,* synchronous with the *maternal* pulse and the *fetal heart-sounds* (120–150 double beats); sometimes also the short, blowing *funic souffle,* synchronous with the fetal heart. If the fetal heart-sounds are heard the fetus is unquestionably living. In the first vertex presentation the fetal heart-sounds are heard most distinctly at a point midway between the umbilicus and the left anterior superior spine of the ilium, emanating, when the fetal back is rotated forward by the labor-pains, not from the back, but from the breast of the fetus. Fetal movements are often heard as early as the fourth month—quick, sharp noises like the ticking of a watch—either spontaneously or when the uterus is irri-

FIG. 29. **Vertical Sagittal Section of the Pelvis through the Ligament, Not Including the Uterus** (modified from Freund): 1, horizontal ramus of the os pubis; 11, ascending ramus of the ischium; 2, vesico-uterine peritoneal excavation; 3, bladder: 4, tube in transverse section; 5, ureter; 6, peritoneal fold of recto-uterine excavation (7); 9, attachment of the uterosacral muscular bands running to the sacrum; 10, rectum. The vagina and portio vaginalis are seen through the opening.

FIG. 30. **Coronal Section through the Pelvis, showing the Muscles, Fasciæ, and Ligamentous Bands in the Neighborhood of the Genital Tract:** 1, peritoneum; 2, superior or deep; 5, inferior or superficial layer of the triangular ligament [2, pelvis; 5, perineum proper]; 4, levator ani muscle, embracing the vagina; 3, connective tissue above, and 6, below the fasciæ (2 and 5) covering the levator ani muscle; 7, obturator fascia; 8, constrictor cunni (continuation of the sphincter ani from the coccyx to the symphysis): 9, obturator internus.

For explanation of FIG. 31, **Arteries of the Genital Organs**, see § 1, p. 26.

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tated by rubbing or kneading. Later the sounds are more dull.

In rare instances singultus and trembling of the lower jaw, as in a crying child, have been heard (Meyer, Zürich).

INTERNAL EXAMINATION.

A vaginal examination during pregnancy subserves a variety of purposes: In the first place, it is the only means of arriving at a diagnosis during the first half of gestation. It reveals the character of the *pelvic cavity* and of the *soft parts*, the presence of any obstacle which might interfere with the subsequent course and termination of pregnancy; and finally, at the end of gestation, the signs of approaching labor. After labor has begun, however, internal examination is dangerous and should be made only for *very urgent reasons*. The mucous membrane is soft and easily injured by the examining finger, and the puerperal uterus, from its deep situation within the abdominal cavity and enormous capacity compared to the caliber of the canal which drains it, is extremely liable to infection, being filled with necrotic material, thrombi, and blood, especially if the body-temperature continues high.

Tab. 17.

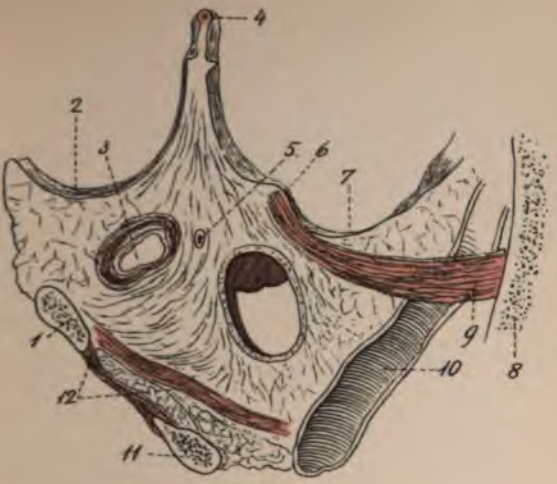

Fig. 29

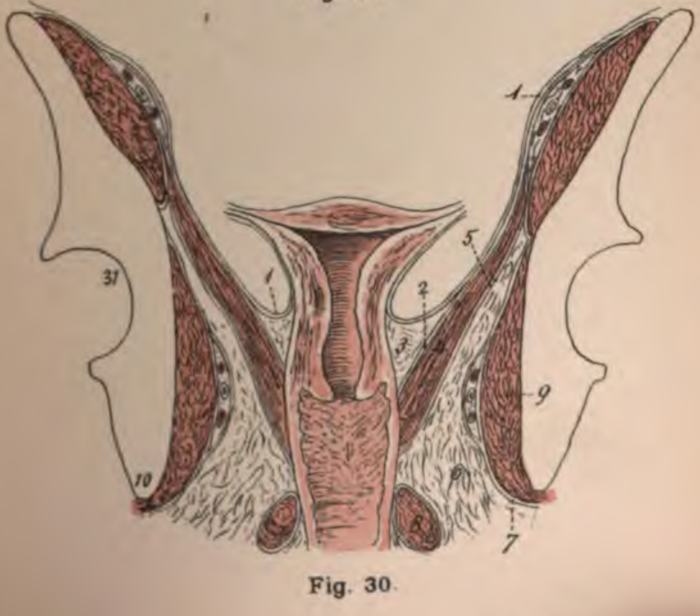

Fig. 30.

Lith. Anst. F. Reichhold.

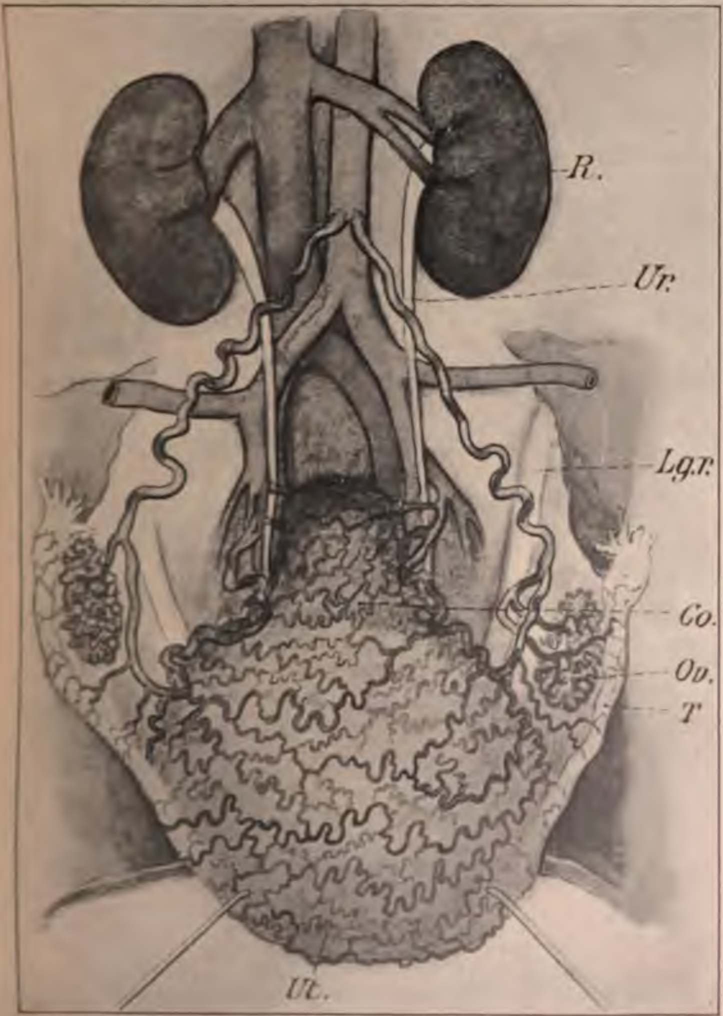

FIG. 31.

The danger of infection is therefore greater than in any other kind of wound, particularly after the membranes have ruptured. The busy practitioner, especially the country doctor who is rarely able to get any one to take his place, should remember in such cases that *absolute* surgical cleanliness cannot possibly be achieved within twenty-fours hours after contamination by attendance on a puerperal-fever patient, by the dressing of an infected wound, or by exposure to the germs of scarlet fever, diphtheria, etc. In any case a full bath and complete change of dress are imperative. The examiner's hands and the woman's vulva must be disinfected with the utmost care, the former even for the examination of a pregnant woman.

In a critical case the question to be answered is: Do the best interests of mother and child urgently demand a vaginal examination?

Seamless rubber gloves which do not in the least interfere with the sense of touch are very useful.

The best *method of disinfecting* the skin of the hands, vulva, and abdomen consists in vigorous rubbing with a brush and plenty of hot water and soap or soda-solution, so as to remove all the fat from the pores. Sand may also be used, with proper care, to make the rubbing more effective. Any folds in the skin are to be carefully smoothed out and rubbed clean. The examiner must first clean his nails, which should be closely trimmed, with a nail-file and a soft cloth.

The parts are then scrubbed with alcohol, if any is at hand, and lastly with some antiseptic fluid, whereupon the examiner, without drying his hands or anointing them with a doubtful so-called "carbolated oil" preparation, inserts his forefinger into the vagina, while with the other hand he separates the lips of the vulva, which has previously been carefully cleansed. Before proceeding with the vaginal examination the *bladder* and *rectum* must be emptied, as otherwise accurate results are impossible.

In this connection may be mentioned the peculiar livid

FIG. 32. **Position of the Non-gravid Uterus,** when the bladder and rectum are moderately distended. Peritoneum and subdivisions of the cervix indicated by red lines (original drawing).—The uterus lies normally in a position of *anteversion* and slight *anteflexion*, in close relation with the bladder, to which the cervix is firmly attached in the median line by means of bands of connective tissue. The uterus, therefore, follows the movements of the bladder. The body of the uterus is freely movable, being limited only by the intestines, and is covered with peritoneum (red line), an *anterior* fold extending into the *vesico-uterine* excavation as far as the internal os, while a *posterior* fold, lining the *recto-uterine* space or Douglas' pouch, extends lower and sends out two processes: the first, formed by a fold of peritoneum at the level of the posterior fornix, contains the *uterosacral muscular bands* which run to the sacrum; while the second is on a level with the external os. The cervix is divided into three portions: 1, the *supravaginal portion*, extending from the internal os to the posterior fornix; 2, the *intermediate portion*, from that point to a line drawn through the anterior fornix; 3, the *portio vaginalis* proper.

The uterine cavity and vagina together represent a curve with its concavity looking toward the symphysis. The vagina is a muscular tube with thin walls and a larger lumen than that of the uterus, the "portio vaginalis" of which projects into it and forms the deep *posterior* and short *anterior* fornix. In cross-section the lumen of the vagina presents the shape of a capital H. The vagina is held as in a sling by the *levatores ani* muscles and their continuations, the *constrictores cunni* (see Figs. 9, 29, 30, 69). The vaginal passage is closed at the *introitus* by the *hymen* or its remains, the *carunculæ myrtiformes*, behind which the *fossa navicularis* is situated. Externally the canal is closed by the labia and by the perineum, with the *frenulum perinei* (fourchette) between the labia.

It is of practical moment to remember that above the perineum the rectovaginal septum becomes much narrower, corresponding to the point where the ampulla of the rectum comes into close relation with the vagina.

FIG. 33. **Position of Fundus and Portio Vaginalis in Each Month of Pregnancy** (after B. S. Schultze).—The numbers with periods after them indicate the various positions of the fundus and portio vaginalis and the degree of abdominal distention. The other numbers refer to the anatomical designations common to all the figures in the author's atlases (see Index).

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coloring of the vulva, resembling the color of *wine-yeast* or the *blossom of the colchicum plant* (see Fig. 37), which may be observed at any stage of pregnancy, often after the failure of the first menstrual flow. During the later

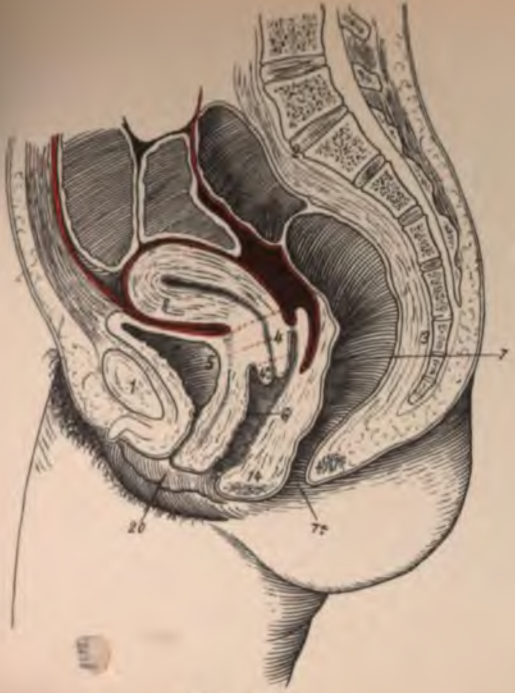

Fig. 32.

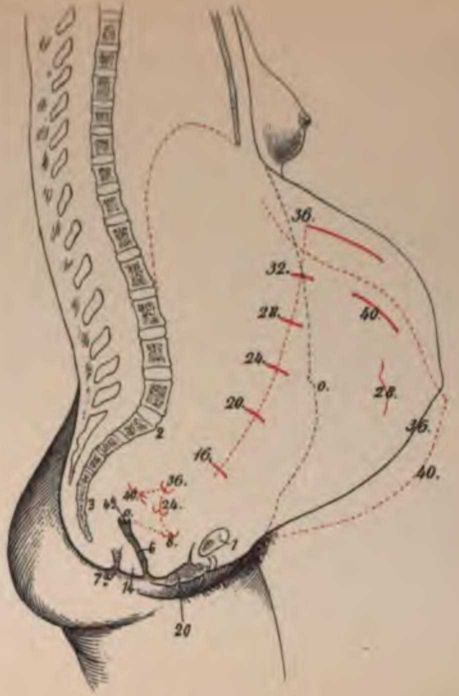

Fig. 33.

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months *edema* and *phlebectasia* of the external pudenda are often observed.

The examiner's attention should be directed to the following points: the state of the perineum and pelvic floor, whether yielding or rigid, or, in multiparæ, showing the scars of previous tears; whether the introitus is *oversensitive* to the examining finger; whether there is any tendency to vaginismus; the state of the vagina, whether soft and smooth or rough (in inflammatory conditions and in many multiparæ); the amount of secretion on the vaginal walls, and whether they are relaxed and thrown into folds, or rigid and the seat of scars and stenoses; the position of the *vaginal portion*, whether, as usual, in the interspinal line or directed backward and upward—a condition which is of no consequence in the beginning of pregnancy, but may constitute a serious obstacle to labor at term if the uterus has been fixed too high in the operation of vaginovesical fixation—or whether it is directed forward toward the symphysis early in the course of pregnancy. This would point to the probable existence of retroflexion or bending backward of the uterus, normally directed forward (see Figs. 17 and 32), under the sacrum and into Douglas' pouch (Figs. 18 and 102).

The following points are of especial importance in connection with pregnancy and labor:

The Portio Vaginalis.—Up to the eighth month the vaginal portion of the cervix in a *primigravida* feels like a hard, conical projection with a round depression, the internal os, at the summit; at this time it apparently becomes shorter, being covered by the hypertrophied folds of the vagina, and disappears during the last few weeks in consequence of the dilatation of the os. In *multigravidæ*, on the contrary, the lips of the internal os persist, being broader than the cervix, which feels like a *soft fragment* of *tissue* lying between folds of the vagina. It forms a *transverse cleft* with *notched* edges.

During the earlier months of pregnancy the *height* and *direction* of the portio vaginalis are not changed; the

Fig. 34. External examination for the purpose of determining the height of the fundus and the position of the fetal back.

Fig. 35. Locating the head before its engagement in the superior strait.

Fig. 36. After the head has entered the true pelvis. The hands are to be pressed downward and inward to reach the true pelvis.

Fig. 37. **Vulva of a Primigravida** in the seventh month (original water-color from life).—Colchicum color and edema of the nymphæ.

Fig. 38. **Colchicum-colored Fornix of the Vagina** from the same case. —Compare the color with the simple hyperemia of the middle folds of the vagina.

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direction of the uterus varies so much within physiological limits in different individuals that it is impossible to give a typical picture. Fig. 32 is an attempt to represent approximately the usual position of the non-gravid uterus. As soon as the uterine body begins to project above the symphysis, which occurs in the fourth month, it is inclined forward, the cervix assuming a corresponding *backward* direction (Fig. 19). As the organ continues to ascend, the vaginal portion rises above the interspinal line; *the external os rests on the posterior fornix near the upper sacral vertebræ* and is turned toward the *left*, the body of the uterus having its transverse axis in the *right oblique* diameter of the pelvis and being directed toward the *right*. The latter condition begins in the fourth month. This sometimes makes it possible to palpate the sound ligament on the left side.

The **bladder** is drawn upward, so that obstruction and dilatation of the ureters and pelves of the kidneys sometimes occur.

The **os** is usually directed *backward* and *downward* (sometimes directly backward if the anterior wall of the uterus sags), or the cervix may be bent upon the body in such a way that the external os looks forward and the internal os backward.

In making a vaginal examination the physician should, therefore, ascertain the position, direction, shape, and consistency of the portio vaginalis; the condition and degree of dilatation of the (external) os; and, finally, the disten-

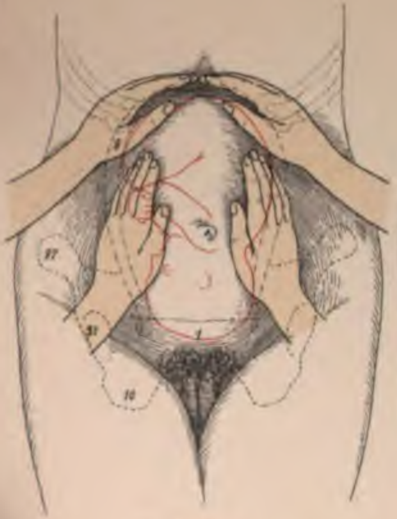

Fig. 34.

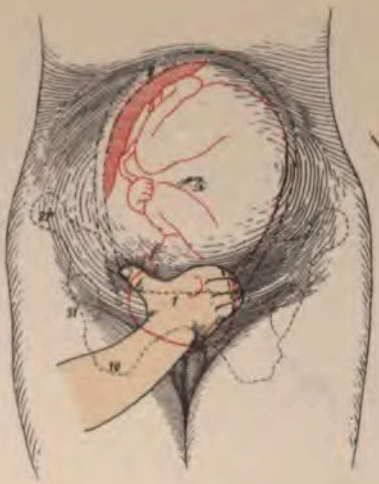

Fig. 35.

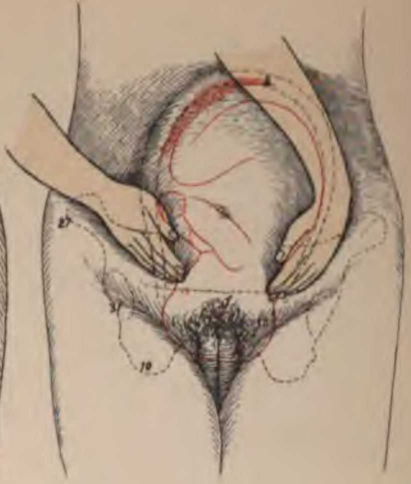

Fig. 36.

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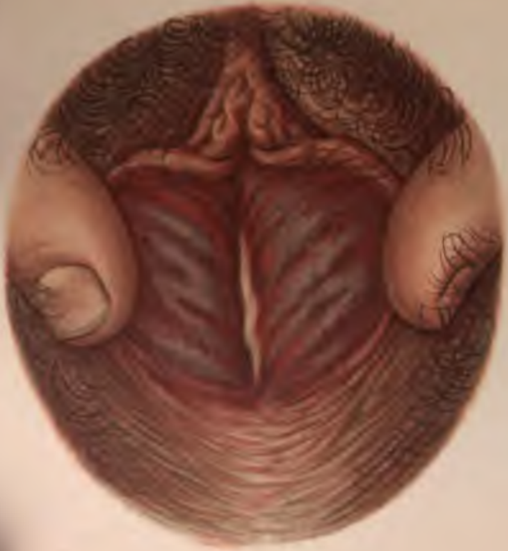

Fig. 37.

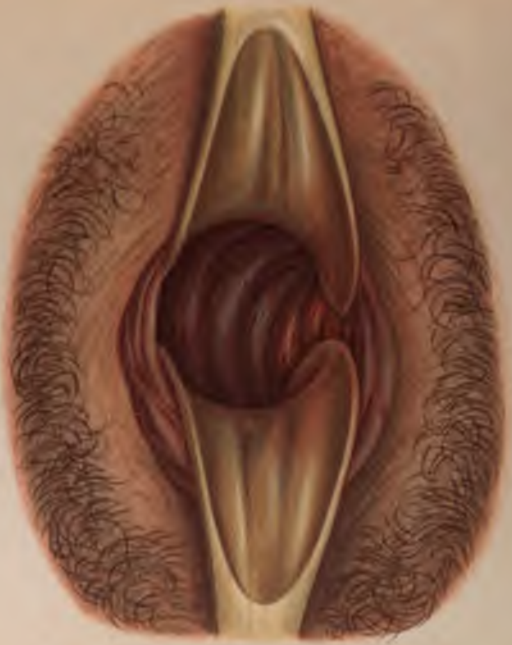

Fig. 38.

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tion of the **cervical canal** and **internal os.** These points are embodied in the follow table:

DIFFERENCES OBSERVED AT TERM BETWEEN A PRIMIGRAVIDA AND A MULTIGRAVIDA.

A PRIMIGRAVIDA	A MULTIGRAVIDA.
Vulva: Closed.	Gapes slightly; scars.
Vagina: Narrow and rough.	Wide, soft, and smooth.
Portio: Soft, relaxed cone.	Not conical: soft, edematous mass.
External os: Round with sharp edges; closed until ninth month, after that admits first phalanx.	Open after fifth month; edges not sharply defined, notched; transverse cleft.
If pervious, labor in a few days.	*If cervical canal* is quite patulous, labor in two weeks.
Internal os: Closed; sometimes opens before external os; opens during labor at the same time as cervix, and before the external os.	Opens during ninth month.
Position of head at the end of gestation within the true pelvis.	Until the beginning of labor above the superior strait, or but slightly engaged in the true pelvis, so that it is freely movable.

During the first three months the *size*, *shape*, *consistency*, and *position* of the uterine body can be ascertained by means of bimanual examination, one hand on the abdomen, the fingers of the other in the vagina or rectum. If the uterus cannot be felt above the anterior fornix, and the vaginal portion is in contact with the pubic symphysis, there is *retroflexion*, which may, and usually does, correct itself spontaneously as pregnancy progresses. It is better practice, however, to replace a retroflexed uterus, because the procedure incidentally reveals the presence of any inflammatory adhesions in Douglas' pouch.

A characteristic sign in the early stages of pregnancy is the *doughy softness in the region of the internal os*—Hegar's sign. It forms a conspicuous area of relaxation, separating the hard, globular uterine body, distended by the ovum, from the cervix, which does not lose its hardness until later.

In the bimanual examination the physician should search for *other abnormalities*, such as tumors of the genitalia or their adnexa, or of neighboring organs, malformations of the uterus or vagina (double vagina, septa, etc.), inflam-

FIG. 39. **Usual Position of Portio Vaginalis**, directed obliquely backward and downward, in a multipara at term.—The external os is open; the head has not yet entered the true pelvis; *second vertex presentation* (back on the right side, R. O. A.). *Digital method of measuring diagonal conjugate* (from the lower border of the symphysis to the promontory of the sacrum). (Original drawing.)

FIG. 40. **The Head has Entered the True Pelvis** (at term) **and is Pushing the Anterior Lower Uterine Segment downward; the Portio Vaginalis is directed Upward and Backward.**—Primigravida, *first vertex presentation* (L. O. A.). It is often difficult in these cases to reach the os; the finger should be bent at the distal joint (original drawing).

FIG. 41. **Anterovertical Position of the Portio Vaginalis** in a primigravida at term.—The head is engaged in the superior strait; cervical canal still closed (original drawing).

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matory processes, abscesses, extravasations in Douglas' pouch, etc. The uterine artery can usually be felt pulsating through the vaginal wall. Examination of the portio vaginalis and of the walls of the vagina with a speculum is useful only in the beginning of pregnancy; it shows the wine-yeast or colchicum color of the parts (see Figs. 37 and 38).

From the beginning of the fifth month the parts of the fetal body can be distinctly felt, and fetal movements as well as the fetal heart-sounds, 120–150 double beats per minute, can be heard. In this month the dilatation of the external os begins in multiparæ. A more accurate calculation of the duration of pregnancy now becomes possible.

At the end of pregnancy our calculations as to the *onset of labor* are based on the state of the cervical canal, the position of the head relative to the superior strait, the size of the child, and the level of the fundus.

The *general rule* for calculating the *termination of pregnancy* is to count back three months from the date of the last menstruation and add from seven to ten days. The "average duration" of pregnancy is two hundred and sixty-five to two hundred and eighty days; but there are well-authenticated cases in which the duration was three hundred days and over, a circumstance which is sometimes important in a medicolegal point of view. Occasionally an ovum discharged during the preceding period is fertil-

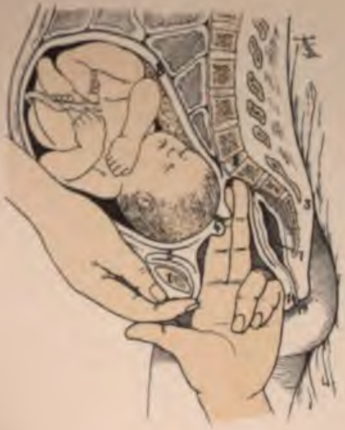

Fig. 39.

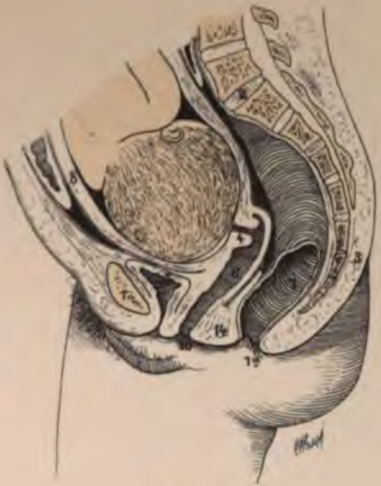

Fig. 40.

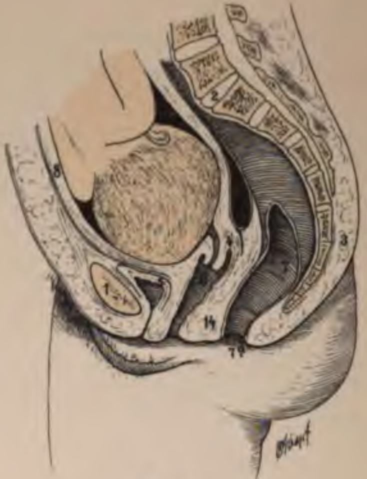

Fig. 41.

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ized, but this is rare; the impregnated ovum usually dates from the time of the first menstruation missed. The great vitality of the spermatozoa makes conception possible even when there is an interval of a week or more between menstruation and coitus. Lastly, it must be borne in mind that ovulation may take place in the intervals between the menstrual periods.

To recapitulate, the *diagnostic signs* of *pregnancy* are:

(*a*) *Probable signs*, derived from the *mother* and emanating from her *generative organs*, as: livid color of nymphæ; relaxation of the vaginal portion of the cervix and characteristic softening of the internal os; increased secretion in the cervical canal, which becomes dilated in the fifth month in multiparæ; globular enlargement of the uterine body in the sagittal diameter; enlargement of the mammary glands due to beginning secretion (serous from the second month on) and swelling of glandular acini, which radiate in thickened cords from the nipple to the periphery; enlargement of the abdomen, striæ (reddish if recent, in multiparæ alternating with whitish scars, due to stretching of the elastic tissues and parallel displacement of subcutaneous fibers), pigmentation in the median line of the abdomen; cessation of the menses; uterine bruit.

The greater number of these signs may be observed in inflammatory conditions, circulatory disturbances, and with tumors of the generative organs; for instance, milk secretion of the mammæ.

(*b*) *Positive* signs belonging to the child, as: palpation of fetal parts and fetal movements; auscultation of the latter, of the fetal heart-sounds (120–150), and of the synchronous funic souffle.

The most typical of the *unreliable* signs are: morning sickness; vertigo; irregular stools (constipation and diarrhea); frequent micturition; edema and varicose conditions of the lower extremities; various forms of neuralgia. These symptoms are more pronounced in neuropathic subjects, and especially in twin and extra-uterine pregnancies. Pigmentation of the face, hollow eyes and cheek and psychic alterations are also to be men

In addition to these general phenomena we find corresponding changes in all the organs of the body during pregnancy. For the purpose of comparison the following table has been compiled, to show the changes incident to the pregnant state and the retrograde changes observed in the puerperium :

ALTERATIONS IN THE NON-SEXUAL ORGANS DURING PREGNANCY AND IN THE PUERPERIUM.

Pregnancy.	*Puerperium.*
Bladder : Displaced upward, compressed ; increased desire to urinate or frequent micturition ; ureters and pelvis of kidney dilated, degeneration of renal epithelium.	*Urine :* Quantity diminished on the first and second day ; minimum is reached on the fourth day, after which it begins to increase ; contains lactose, acetone ; percentage of nitrogen in proportion to amount of milk secretion (greatest, therefore, from the third to the fifth day) ; peptonuria (due to breaking down of uterine muscle ; also found in the lochia ; absent after amputation of uterus) ; pepsin.
Urine : Quantity increased, specific gravity lower, contains *albumin*, and sometimes sugar (the *kidney of pregnancy ;* the urine must always be examined) ; *kidneys, liver, spleen*, and *thyroid gland* hypertrophied.	*Pulse*[1] *:* Often falls to 40–60 immediately after delivery and is soft ; this does not by any means occur in all cases, as was formerly supposed, perhaps not even in the majority ; idiosyncrasy plays the most important rôle.
Heart : Left ventricle probably hypertrophied (the pulse is more rapid, and a difference is observed when the patient changes from a recumbent to a standing posture, which is possible only after compensation has been established).	Leukocytosis disappears ; number of red blood-corpuscles unchanged, hemoglobin diminishes in the first few days. Toward the end of the lochia serosa (seventh day) both red and white blood-cells are increased. At this time many *microcytes* and small, highly refractive elements are seen.
Blood : Hydremia and leukocytosis ; during the first half of pregnancy the number of red blood-corpuscles is diminished (hence the hydremia) ; hemoglobin increased.	

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[1] Various reasons are given for the remarkable diminution in the pulse-rate so often observed after childbirth, such as alteration in the blood-pressure, the mental and physical rest in the horizontal position and collapse of the abdomen (hence stasis in the abdominal veins, less blood in the heart and lungs, fall of blood-pressure), the slowing of the respiration, *general retardation of all the functions*—pulse-rate diminished during inspiration (sucking action of lungs in the pleural cavity ; the lung capacity rises on the third to the fifth day). Other theories, as absorption of the fatty uterine muscle, disturbances of innervation, less deman on the heart, etc., appear to be refuted by the facts that the same redu tion in the pulse-rate is observed after abortions, or as early as thre hours postpartum, and that the urine is increased in amount. Th reduction in the pulse-rate is rarely observed in neuropathic women.

Lungs: Widely separated from each other, diaphragm high, thorax expanded laterally and sagittal diameter diminished. Vital capacity unchanged.	Vital lung capacity increased on the third day.
Inner table of skull: Osteophytes.	
Gums hypertrophied.	
Skin: Increased secretion, chloasmata.	
Phlebectasiæ in the lower extremities.	
Intestine: Much constipation, at first diarrhea; hemorrhoids.	Physiologic constipation till the third or fourth day (size of stools increases when meat-diet is taken).

The following points are important in the *differential diagnosis* of pregnancy from other conditions:

1. Menstruation persists and is, as a rule, increased in *metritis, myoma* of the uterus, and *ovarian cysts. There is no change in the patient's condition.* If there is a tumor and menstruation ceases, the neoplasm is usually found to be attached to the uterus by a distinct *pedicle*, consisting of the tube and ovarian ligament, and the question of ectopic gestation must be considered.

2. In *hematometra* menstruation is absent from the start. On examination with the speculum and uterine sound the cervix is found to be occluded, the menstrual blood being collected above the cervix within the uterine body or in the tubes. (Great care must be observed in the combined examination.)

3. *Para-* and *perimetritis* give rise to febrile attacks, which should be inquired for; the examination is attended with great pain.

4. In *retroflexion* there is a characteristic anterior displacement of the vaginal portion of the cervix and the anterior lip of the os is much attenuated. The portio vaginalis itself is hard; the uterine body cannot be felt above the anterior fornix. The differential diagnosis is often very difficult, as a retroflexed uterus is apt to become excessively swollen and soft. If the pain continues severe and menstruation is persistently absent (with retention of urine), the possibility of pregnancy in a retroflexed uterus should be considered.

FIG. 42. **Measurement of the Transverse Diameter of the Outlet** (after Breisky): 10, tuberosities of the ischia; 7*a*, anus; 20, introitus vaginæ.

FIG. 44. **Accurate Measurement of the True Conjugate with the Pelvimeter** (after Skutsch).—With this instrument, which can be easily bent in any direction, the examiner first measures the distance between the promontory and the external surface of the symphysis (continuous lines), and then the thickness of the latter (broken lines), introducing one branch of the instrument through the vagina, the bladder having been previously evacuated. The difference between these two measurements is the true conjugate.

FIG. 45. **Measurement of the External Conjugate** (diameter of Baudelocque) **with the Baudelocque-Martin Pelvimeter** (Fig. 43; original drawing).—Measure from the upper edge of the symphysis, compressing the overlying fat, to the spinous process of the last lumbar vertebra in the deepest part of the rhomboid fossa.

FIG. 56. **Accurate Measurement of the Transverse Diameter of the Inlet with the Same Instrument.**—First ascertain the distance from the iliopectineal line (extremities of transverse diameter) to the outer surface (trochanter) of the opposite thigh (continuous lines), and subtract the distance from trochanter to iliopectineal line on the same side (broken lines); the result represents the transverse diameter of the pelvic inlet.

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or scoliosis of the vertebral column. Attention should be given to the general build of the patient, whether she is rachitic or dwarfish in stature; to the shape of the head, whether square with high frontal eminences; and to the shape of the chest (chicken-breast) and legs (bow-legs). If the distance between the two anterior superior spines of the ilium can be spanned with the outstretched hand the pelvis is *contracted*. This distance, from thumb to little finger on an average man's hand, is about 9¼ in. (23 cm.).

The following *external measurements* are taken with the Baudelocque-Martin pelvimeter (see Figs. 43 and 45):

1. The *distance between the anterior superior spines*, 10¼ in. (26 cm.) in the living subject; 9½ in. (24 cm.) in the skeleton. Place the knobs of the pelvimeter firmly against the spines.

2. The *distance between the crests of the iliac bones*, 11¼ in. (28 cm.) in the living subject; 10¾ in. (27 cm.)

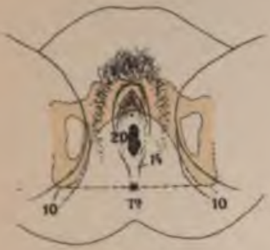

Fig. 42.

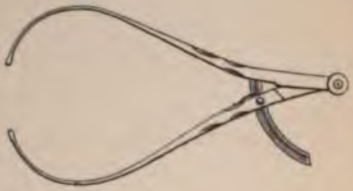

Fig. 43.

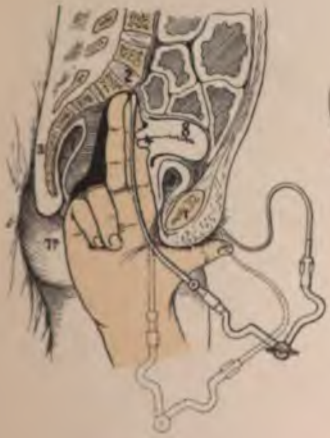

Fig. 44.

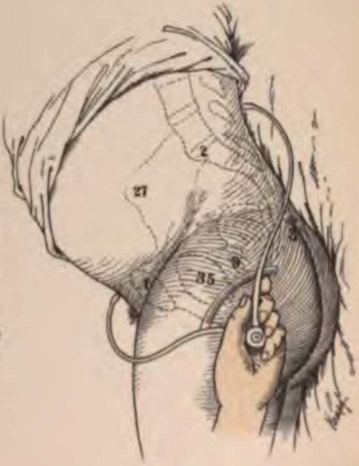

Fig. 45.

Lith. Anst. F. Reichh

in the skeleton. Measure between the two points most widely separated.

3. The *diameter of Baudelocque* (external conjugate), 7¾ in. (19.5 cm.) in the living subject; 7¼ in. (18 cm.) in the skeleton. This diameter corresponds to the distance between the spinous process of the fifth lumbar vertebra and the upper edge of the symphysis pubis.[1]

4. The *transverse diameter of the pelvic outlet*, 3¼ to 4 in. (8 to 10.8 cm.) in the living subject; 3¼ to 3⅝ in. (8 to 9.2 cm.) in the skeleton. Place the woman in the lithotomy position and measure between the inner edges of the tuberosities[2] (see Fig. 42).

And in *deformed pelves:*[3]

5. The *external oblique diameter*, 9 in. (22.5 cm.) in the living subject; 8½ in. (21.5 cm.) in the skeleton; from posterior superior spine to anterior superior spine of the opposite side. Both diameters should be measured.

6. The *anteroposterior diameter of the pelvic outlet* (conjugate of pelvic contraction), 4 to 5½ in. (10 to 14 cm.) in the living subject; 4½ in. (11.5 cm.) in the skeleton. Sims' position; from the lower extremity of the sacrum to the lower border of the symphysis.

7. The *intertrochanteric distance*, in the living subject, 12½ in. (31 cm.). Place the knobs against the outermost points of the trochanters, the legs being extended.

8. The *distance between the posterior superior spines*, in the living subject, 3⅞ in. (9.8 cm.). Place the knobs in the dimples on either side of the spine.

9. The *circumference of the pelvis*, in the living subject, 36 in. (90 cm.). Measure with the tape from the symphysis to the middle of the sacrum along the lower border of the ilium and back on the other side.

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[1] The spinous process of the last lumbar vertebra is the second process felt above the line joining the two dimples which mark the position of the two posterior superior spines, at the deepest point of the rhomboid fossa.

[2] Klien's instrument is a useful one for this measurement.

[3] See, also, under *generally*, *obliquely*, and *transversely contracted* and *compressed pelves*.

FIG. 46. **Palpation of the Spines of the Ischium** after the head has descended (original drawing).—The head is completely engaged in the true pelvis and "immovable." The cervical canal is "obliterated," being completely filled by the head; the external os is about as large as a half-dollar. The sagittal suture coincides with the right oblique diameter; the largest diameter of the head is below the inlet in the plane of greatest expansion. (The red lines show the contour of the pelvis; for numerals, see Index).

FIG. 47. **Sagittal Section through a Fetal Pelvis.**—The red lines represent the soft parts.

FIG. 48. **Sagittal Section through the Fully Dilated Birth-canal Represented Within the Pelvis;** the soft parts are stretched to their utmost (for instance, 14, perineum). The resistance offered by the bony and soft parts is indicated by arrows. The direction taken by the advancing head as it emerges is also shown by a curved line of arrows (the curve of Carus). The coccyx (3) and the perineum are forced *backward.* The axis of the pelvic canal passes through the centers of the conjugates of all the pelvic planes. Its curve is determined by the concavity of the sacrum and coccyx on the one hand, and by the greater height of the posterior wall of the pelvis compared to the anterior, *i. e.*, the symphysis (1); 40 and 41, tuberosacral and ischiosacral ligaments.

With the exception of the *fourth*, these measurements have only a relative value. For instance, the distance between the spines should be less than that between the crests. In the *rachitic* pelvis this *relation* is *reversed.*

By subtraction we estimate approximately the following more important *internal* measurements:

The distance between the crests *minus* about $5\frac{5}{8}$ to 6 in. (14.1 to 15 cm. [$4\frac{5}{8}$ to 5 in. = 11.5 to 12.5 cm. in flat pelves]) is equal to the *transverse diameter of the inlet*, $5\frac{1}{2}$ in. (13.5 cm.).

The oblique diameter *minus* about 4 in. (10 cm.)—the right is normally somewhat longer than the left[1]—equals the *oblique diameter of the inlet*, 5 in. (12.5 cm.).

The external conjugate *minus* $3\frac{1}{4}$ to $3\frac{5}{8}$ (8 to 9 cm.)

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[1] The normal pelvis presents a slight scoliosis toward the left side, hence the *right* oblique diameter, from the *right* sacro-iliac articulation to the pubic spine of the opposite side, somewhat exceeds in length the left oblique diameter at the inlet; the right half of the pelvis is somewhat flattened and the sacrocotyloid distance on that side is shorter than on the other. The external diameters usually bear the same relations to each other as the internal, especially if the difference is great.

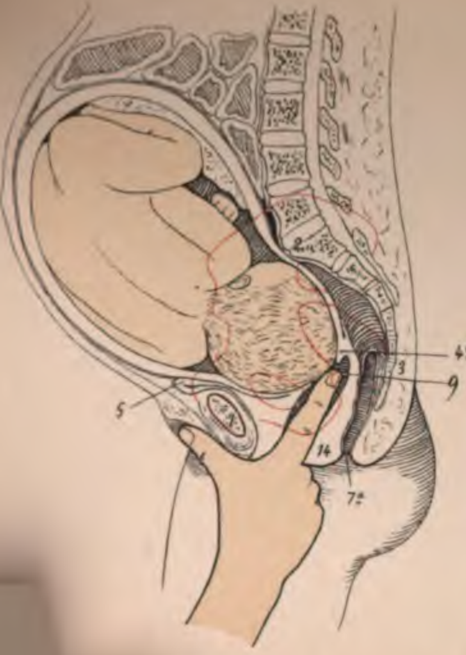

Fig. 46.

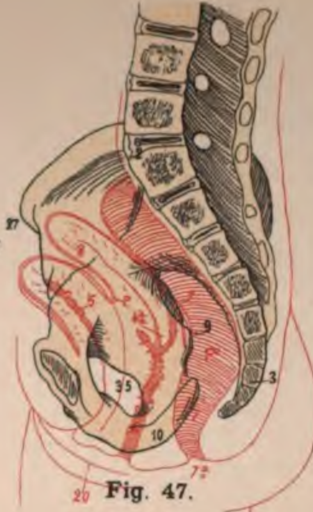

Fig. 47.

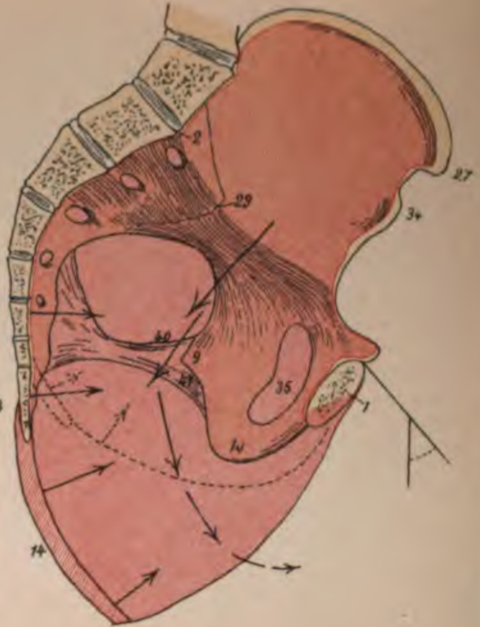

Fig 48

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equals the *true conjugate*, 4½ in. (11 cm.). If the external conjugate is 6½ in. (16 cm.) or less the pelvis is certainly contracted; if 7¼ in. (18 cm.) it is contracted in half the cases.

The following *internal measurements* are actually made: The *diagonal conjugate*,[1] 5 in. (12.5 cm.) *minus* ⅝ in. (1.5 cm.)—in flat rachitic pelves, ⅘ to 1 in. (2 to 2.5 cm.) = the *conjugata vera*, 4½ in. (11 cm.), from the lower border of the symphysis to the promontory. The index and middle fingers are inserted into the vagina, with the thumb placed against the symphysis and the other two fingers folded into the palm, and the promontory is felt with the middle finger (Fig. 39). The examining finger is then swept along the curve of the iliopectineal line to detect any points of abnormal resistance, asymmetry, or exostoses, especially at the so-called synchondroses or points where the several layers of fetal bone become fused.

The measurements of the inlet can also be accurately determined with the aid of instruments, after Skutsch (see Figs. 44 and 56).

Skiagraphy naturally suggests itself as an aid to pelvimetry, particularly as only a few minutes' exposure is necessary for the purpose. In fact, it is possible not only to obtain a clear picture of the pelvis but also to measure certain distances. Radioscopy alone (with the screen) gives a more or less satisfactory picture in the non-pregnant woman; it is best to use the plate in the dark chamber. The woman is placed on her back and the plate pushed well under the buttocks, so that it projects 2 in. (5 cm.) beyond the vulva. These skiagraphs are particularly useful in the diagnosis and measurement of asymmetrical pelves: they furnish the following measurements: 1. The distance between the posterior superior spines; 2, the width of the sacrum; 3, the distance from the lumbosacral crest of the spine to the posterior superior spine of the ilium; 4, the distance from the middle of the promontory to the sacro-iliac articulation.

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[1] The diagonal conjugate is the distance between the lower border of the symphysis and the promontory. From it we calculate the true conjugate, which does not, however, lie exactly in the plane of the pelvic inlet, as the latter cuts the sacrum below the promontory. If, when the woman is examined in the *dorsal position* (Figs. 39, 58), the promontory is beyond the reach of the middle finger, the *diagonal conjugate* exceeds 4½ in. (11.5 cm.); *if the buttocks are raised*, as in Fig. 61, it is 5 to 5¼ in. (12.25 to 13 cm.). A similar increase in the length of the conjugate occurs in *Walcher's* posture (Fig. 62), which is, therefore, a useful position in labor when the pelvis is contracted. On the other hand, the conjugate of the outlet is *shortened* by the Walcher posture and *increased* by the lithotomy position.

The *transverse diameter of the outlet* is obtained from a photograph taken in the sitting posture, deducting ½ in. 1 cm. for the thickness of the soft parts. Finally, one can ascertain the curve of the pubic arch and the transverse diameter of the pelvic inlet.

Dimensions of the Individual Portions of the Normal Female Pelvis.—The *false* pelvis is formed by the iliac bones and the last two lumbar vertebræ; its dimensions correspond to the distances between the various points of the iliac bones, which have just been given. It supports the intestines and, after the fourth month of gestation, the body of the uterus.

The *true pelvis* begins at the *pelvic inlet*, in the plane which passes through the promontory and the upper edge of the symphysis, surrounded by the iliopectineal line. The posterior wall of the true pelvis is formed by the sacrum, the lateral and anterior walls by the ischium and pubis. The ascending and descending rami of these bones enclose the obturator foramen and, with the iliac bone, form the acetabulum for the reception of the head of the femur. In girls between twelve and fourteen the triradiate figure of the synchondrosis can be seen on the floor of the acetabulum. The space between the sacrum and ilium (*incisura ischiadica*) is traversed by two strong bands, the tuberosacral and spinosacral ligaments. The sacro-iliac joint (formed by the "auricular" cartilages) and the symphysis pubis are strengthened by capsules and ligaments. The so-called anterior wall of the pelvis is very narrow, being formed by the two pubic bones, the rami of which, with the rami of the ischium, form the pubic arch.

The cavity of the true pelvis presents several *planes* of varying dimensions (see Figs. 48, 55, 70–72). The *plane of the inlet*; the *plane of greatest pelvic expansion* between the middle of the body of the third sacral vertebra and the middle of the symphysis, its lateral boundaries being the great sacrosciatic notch and the wall of the acetabulum; the *plane of least pelvic expansion*, passing through the rigid sacrococcygeal articulation, the ischial spines, and the lower border of the symphysis (the *interspinal line* in this plane corresponds with the smallest diameter of the pelvis); and the *plane of the outlet*, which is concave, as its boundaries occupy different levels: the movable tip of the coccyx and the lower border of the symphysis and, on a lower level, the tubera ischii.

Not only does the same diameter vary in the different planes, but the relations between the various diameters also vary, so that each plane has a different shape. Considerable differences are noted not only in different races and peoples but also in individuals. The oblique diameters are the most constant of all the diameters at the inlet, while general contractions, and especially a shortening of the true conjugate, are for some unknown reason observed most frequently in certain planes (rachitis).

CONJUGATA VERA.

At the inlet, 4⅜ in. (11 cm.)	between promontory and upper border of symphysis.[1]
In the plane of greatest expansion, 5 in. (12.5 cm.)	third sacral vertebra to middle of symphysis.
In the plane of least expansion, 4⅝ in. (11.5 cm.)	sacrococcygeal articulation to lower border of symphysis.
At the outlet, 4 to 4¾ in. (10 to 12 cm.)	tip of coccyx to lower border of symphysis.

TRANSVERSE DIAMETER.

At the inlet, 5½ in. (13.5 cm.)	greatest distance between iliopectineal lines.
In the plane of greatest expansion, 4¾ in. (12 cm.)	distance between acetabula.
In the plane of least expansion, 4 in. (10 cm.) .	distance between ischial spines.
At the outlet, 4⅜ in. (11 cm.)	distance between tubera ischii.

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[1] The *obstetric* conjugate of the inlet is situated ⅕ in. (½ cm.) lower.

FIG. 49. **Normal Female Pelvis** in erect posture (front view; original drawing from a specimen in the Munich Gynecological Clinic).

FIG. 50. **Generally Equally Contracted Pelvis,** practically a miniature reproduction of the normal pelvis, with, however, certain infantile characteristics. The iliac bones are relatively and absolutely smaller, the promontory is less prominent (original drawing from a specimen in the Munich Gynecological Clinic).

FIG. 51. **Greatly Contracted Funnel-shaped Pelvis** ("Liegbecken," decubital pelvis) **Approaching the Fetal Form** (see §§ 4 and 19).—The sacrum is straight, the iliac bones are small and flat, the pelvic inlet is more circular than normal, and there is marked contraction at the outlet, the result of years spent in bed, from infancy until death, which occurred about the age of puberty. The weight of the trunk, the counter-pressure of the thighs, and the action of the muscles are eliminated (original drawing from a specimen in the Munich Gynecological Clinic).

OBLIQUE DIAMETER.

At the inlet, 5 in. (12.5 cm.)	sacro-iliac articulation to iliopubic tubercle of opposite side.
In the plane of greatest expansion, 5½ in. (13.5 cm.)	great sacrosciatic notch to obturator sulcus of opposite side.
In the plane of least expansion At the outlet	extensible, because bounded by ligaments.

The importance of examining the *pelvis* before giving a prognosis of the probable course of labor has just been emphasized.

§ 4. SHAPE AND INCLINATION OF THE ADULT FEMALE PELVIS AND ITS DEVELOPMENT.

The normal adult female pelvis as contrasted with the male has a *large transverse diameter*. Three factors enter into its development from the fetal pelvis:

The *formation of the promontory;*

Lateral expansion;

Disappearance of the funnel shape.

A knowledge of the structure of the fetal pelvis and *its subsequent* development up to the age of puberty is

Tab. 25.

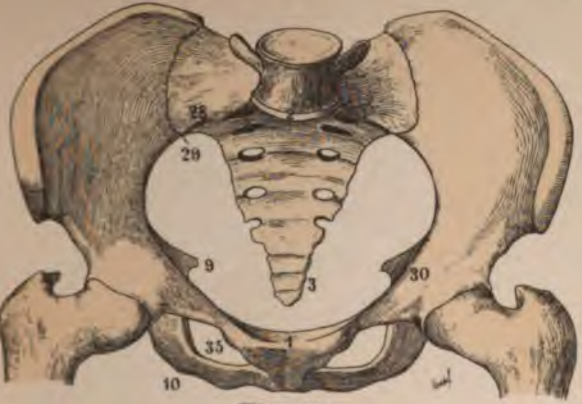

Fig. 49.

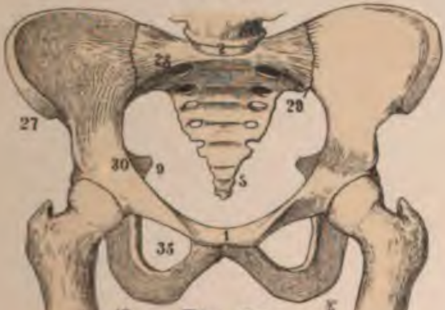

Fig. 50.

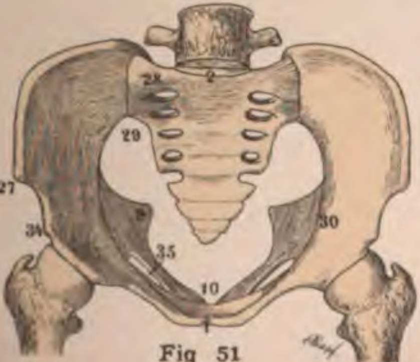

Fig 51

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necessary for the comprehension of the various forms of pelvic deformity.

The shape and inclination of the pelvis are determined by the action of three forces: the *weight of the trunk*, the *counter-pressure* of the *thighs*, and the *resistance* offered by the *symphysis*, and by three developmental factors:

1. A *forward movement* analogous to the anteflexion of the uterus. The promontory falls forward as a result of the superincumbent weight of the trunk (cf. Fig. 53 with Figs. 54 and 55); the sacrum is bent and pushed upward and backward; the ilia and the upper part of the sacrum rotate forward; the *lower* border of the symphysis, which in the fetus projects forward, moves in the opposite direction, backward.[1]

2. The first developmental movement is *almost compensated for* by a *second*, which forces the portion of the pelvis in front of the great sciatic notch *upward*, the most anterior portions (toward the symphysis) being most affected. This is the result partly of the *pressure of the thighs* (cf. Figs. 52, 53, 57 with the "decubital pelvis," Fig. 51), partly of the inherent hereditary tendency of the *right horizontal ramus* of the pubis to undergo rapid growth, and thus produce a lateral expansion of the pelvis, to which among other factors the *sacro-iliac ligaments* also contribute (No. 32 in Fig. 57) by drawing the iliac bones backward. Up to the fifth year this movement plays an important rôle, owing to the softness of the bones, the *transverse* diameter being affected more than the anteroposterior.

3. A slight *scoliosis* of the *pelvis* to the *left* occurs as a result of hypertrophy of the *right* horizontal ramus of the pubis and adjoining portion of the acetabulum, and of the *left* ala of the sacrum and iliopectineal line; the symphysis is displaced to the left.

As a result of the two movements described under 1

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[1] This movement, the result of the characteristic wedge-shaped growth of the lumbar and sacral vertebræ (and the consequent formation of the promontory), is directly dependent on heredity and the erect posture in walking. The tendency begins in the embryonal and fetal period, but its completion is brought about in each individual by the exercise of his functions. The angle of the femur with the long axis of the vertebral column in the fetus, in the new-born, and in the adult is found to be respectively 130, 162, and 195 degrees, showing that there is a gradual movement backward on the part of femur, pelvis, and sacrum. This movement is effected by the extensor muscles of the vertebral column, the sacrospinal muscle (see Figs. 53 and 54); note the military hyperextension of the pelvis in Fig. 54. The influence of muscular action on the shape of the pelvis and of the bones in general has been proven experimentally by dividing the muscles in young animals and observing the subsequent abnormal development of the bones (Kehrer).

FIG. 52. **Female Fetal Pelvis** in erect posture (front view; original drawing from author's specimen).—The sacrum is almost straight; the promontory projects very little. The uncolored surfaces represent the cartilaginous portions that have not yet undergone ossification. The pubic arch forms a right angle.

FIG. 53. **Sagittal Section through a Fetal Pelvis, showing the Angle of the Femur with the Spinal Axis.**—The peculiarities of a fetal pelvis described in the foregoing figure appear even more plainly in this one.

FIG. 54. **The Same in the Adult.**—The promontory has fallen forward; the sacrum is pushed upward and backward; the position of the symphysis is more posterior than in the fetus.

and 2, the *pelvic angle*[1] in the *adult woman* measures from 50 to 55 degrees, in an easy, erect posture with the legs parallel to each other. The angle varies from 40 degrees in a stiff, military attitude, or the attitude of a pregnant woman, to 100 degrees in the recumbent posture with the trunk bent over in front and the knees drawn up ("ano-dorsal position" [see Fig. 61], *i. e.*, lithotomy position). On account of this wide variation the measurement has no obstetrical value, although it is interesting from an anthropological point of view; but the *practical* bearing is of the greatest value as determining the *best positions* for the various *obstetrical* and *gynecological* processes and operations. We shall return to this later.

The *changes* in the pelvis incident to its development are given in the following comparative table, and serve to explain deformities due to arrested development or to pathological conditions in infancy:

Fetal Pelvis.	*Adult Female Pelvis.*
Difference between sexes distinct in the fourth month (Fehling).	
Small transverse diameter, from the third month on.	*Large transverse diameter.*
Conjugate vera: transverse diameter = 100 : 105–108	. . . . = 100 : 122.
Promontory very *high*, lumbosacral convexity very slight.	Promontary projects *forward* and *into* the pelvis, lumbosacral convexity *angular*.

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[1] By *pelvic angle* is meant the angle formed by the plane of the pelvic inlet, or the true conjugate, with the horizon when the body is in the erect posture; in this posture the symphysis is lower than the promontory. The *height* of the posterior wall of the pelvis (promontory to tip of coccyx) is 5¼ in. (13 cm.), that of the anterior wall (symphysis) is 1⅗ *in. (4 cm.).*

Tab. 26.

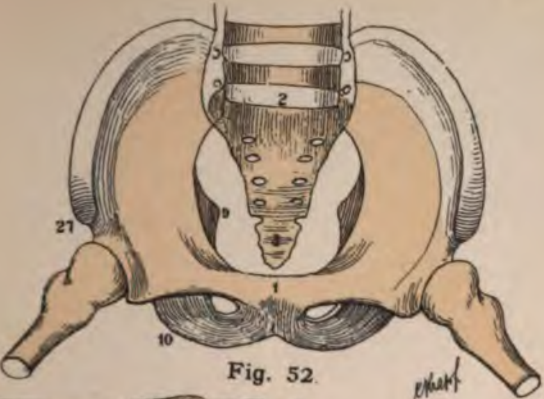

Fig. 52.

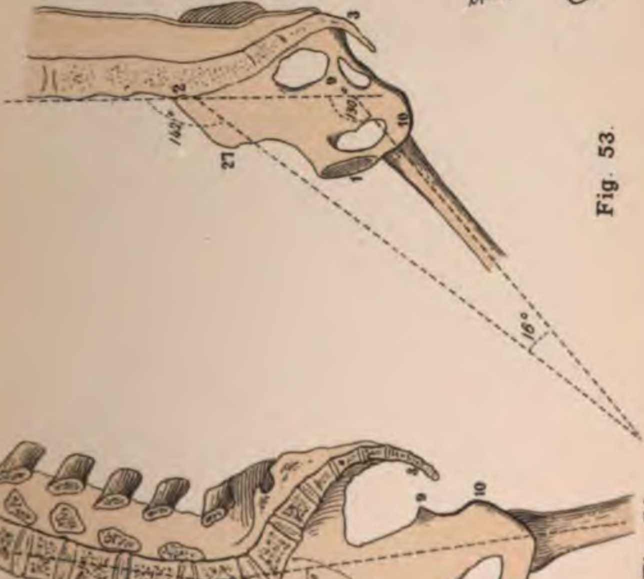

Fig. 53.

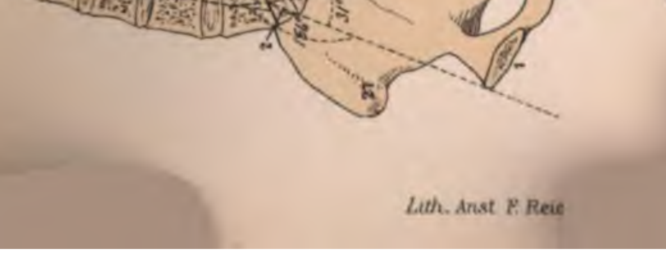

Fig. 54.

Lith. Anst. F. Reic

Angle of pelvic inlet = 75 to 80 degrees	. . . . = 55 to 60 degrees.[1]
Sacrum and coccyx almost vertical and straight.	Sacrum and coccyx vertical and concave.[2]
Sacrum flat from side to side; bodies of vertebræ larger than alæ and cuboidal (posterior and anterior borders at the same level).	Sacrum *concave* from side to side; bodies of vertebræ just as large as the alæ; anterior and posterior borders wedge-shaped.
Sacrum relatively narrow.	Sacrum relatively very broad.
Pubic arch = 70-90 degrees. . .	. . . . 90-100 degrees.
All the diameters of the true pelvis are relatively much smaller than in the adult female pelvis (corresponding, therefore, to the "funnel-shaped" contracted pelvis).	All the diameters of the true pelvis considerably larger compared with the true conjugate, especially the transverse and oblique diameters.
Iliac bones narrow, steep, and flat.	Iliac bones broad, inclined laterally, and concave.
Angle of iliac bone with iliopectineal line = 155 degrees	. . . . = 125 degrees.
Tubera ischii at outlet *nearer* together than spines.	The distance between the spines of the ischium represents absolutely the shortest pelvic diameter.

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[1] If by means of Chrobak's apparatus the mean inclination of the external (Baudelocque) diameter is found to be 46.6 degrees, and that of the true conjugate 51.8 degrees, the mean difference will be in a normal pelvis 5.18 degrees, in a "large" pelvis 8.8 degrees, in the simple flat pelvis still greater—12.9 degrees, while in the rachitic flat pelvis it may be less or even negative. Again, it is greater in rachitic non-contracted pelves (15-23 degrees), and in generally contracted pelves 12 degrees (Savor).

[2] The most dorsally situated portion corresponds to the articulation with the auricular surface of the ilium and to the insertion of the common extensor muscle of the trunk; the *sacral curve* is, therefore, to be considered as the resultant of these two factors: the weight of the trunk and the traction of the extensor muscles of the trunk in the erect posture. The *coccyx* is drawn forward by the coccygeal muscle and the levator ani, that is, toward their points of insertion: the spines of the ischium and the symphysis. The ligaments connecting the spines and tubera ischii with the sacrum have the same effect. According to my investigations the upper portion of the sacrum is rotated backward through 70 degrees, the *posterior* arch of the great sciatic notch the same, but the *anterior* arch rotates only through 40 degrees, that is, the anterior portion of the true pelvis is not rotated backward as much as the posterior portion. As a result, we have the developmental movement described above under No. 2: the tilting upward in front and the diminished inclination of the pelvic inlet in the adult. In the same way the *symphysis* rotates backward only 50 degrees, and as the rotation of the sacrum is 70 degrees, the symphysis is raised a distance proportional to the remaining 20 degrees (see position of symphysis in movement No. 1, this section).

FIG. 55. **Sagittal Section of a Normal Adult Female Pelvis in the Erect Posture** (original drawing from a specimen in the Munich Gynecological Clinic).—To show the inclination of the pelvic inlet, that is, the relative positions of promontory and symphysis.

FIG. 56. **Measurement of the Transverse Diameter of the Inlet,** after Skutsch (see explanation of Fig. 44).

FIG. 57. **Effect of the Pressure of the Thighs and the Traction of the Iliosacral Ligaments (Weight of the Trunk) on the Shape of the Pelvis :** 32, iliosacral ligaments.

FIG. 58. **Pelvic Angle in the Ordinary Dorsal Position.**

FIG. 59. **Pelvic Angle when the Trunk is Raised.**

FIG. 60. **Pelvic Angle with the Legs Drawn Up** (lithotomy position).

FIG. 61. **Pelvic Angle when the Lumbosacral Region is Raised and the Thigh Drawn Up.**

FIG. 62. **Pelvic Angle in Walcher's Position with Legs Hanging Down.**

FIG. 63. **Pelvic Angle in Semilateral Knee-elbow or Sims' Position.** (Original drawings.)

VARIATIONS IN THE PELVIC INCLINATION AND THEIR PRACTICAL VALUE.

In the *flat dorsal position* with the *sacrum slightly supported* the pelvic inclination is 25 degrees (Fig. 58, "inclination of decubital pelvis"). In the *dorsal position* with the *trunk slightly raised* the inclination is 20 degrees (Fig. 59); in Sims' *position* with "hollow back," also 20 degrees (Fig. 59); in the *lithotomy* position (Fig. 60), 30 degrees; in *anodorsal decubitus* (buttocks *raised*, loins touching the couch, legs drawn up, Fig. 61), 60 degrees.

The greatest inclination is obtained in the Walcher position (the woman lies flat on her back and lets her legs hang down over the edge of the couch), with a decubital pelvic angle of 10 degrees (Fig. 62), or by the *knee-elbow position* (*position à la vache*), with an angle of 15 degrees (Fig. 63), which equals that of Sims' position (semilateral knee-elbow position).

"Walcher's position" takes its name from its author, who recommended its use in the flat (*i. e.*, anteroposteriorly contracted) pelvis, because it increases the length of the conjugate from $\frac{1}{5}$ to $\frac{3}{5}$ in. ($\frac{1}{2}$ to $1\frac{1}{2}$ cm.).

If the head is arrested by the symphysis and fails to *engage* in the true pelvis, or if it is desired to make an

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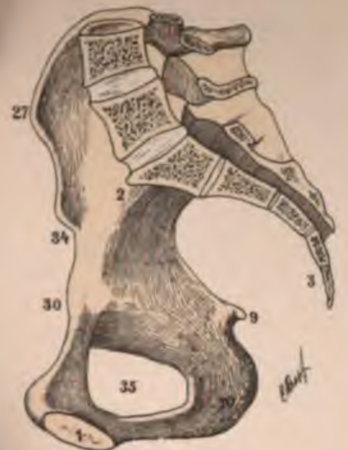
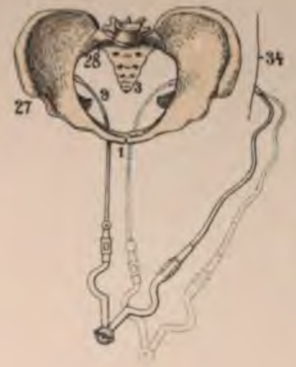


Fig. 55.



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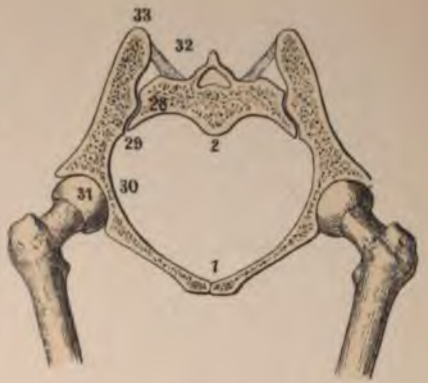

Fig. 57.

Lith. Anst. F. Reichhold, München.

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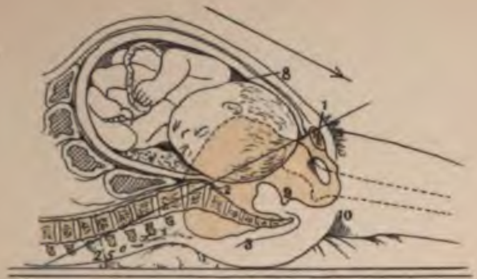

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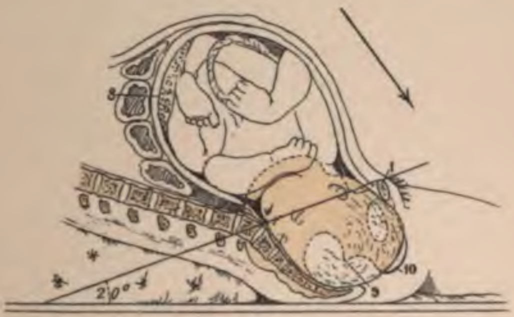

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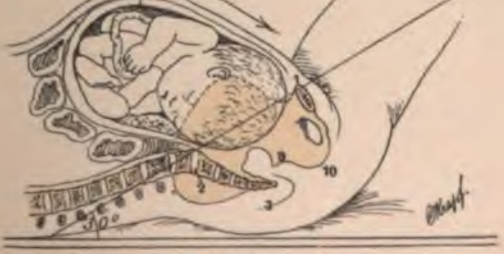

Fig. 60.

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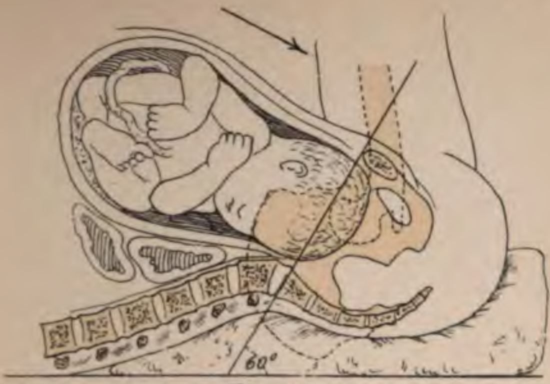

Fig. 61.

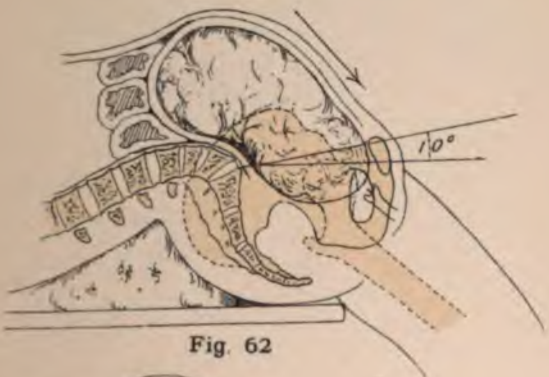

Fig. 62

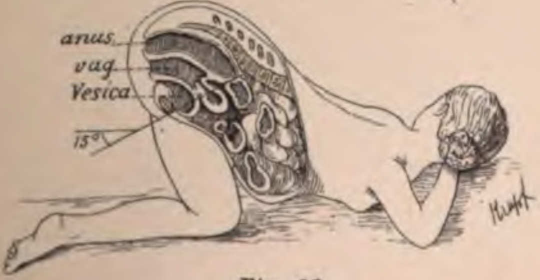

Fig. 63.

Lith. Anst. F. Reichh.

internal examination for the purpose of measuring the diagonal conjugate, the decubital angle may be increased by raising the buttocks and depressing the spinal column (Figs. 60 and 61). By this procedure the promontory is brought nearer the examining finger and the conjugate is increased, being made as nearly as possible vertical to the long axis of the fetus and uterus. The latter falls backward and occupies a plane perpendicular to that of the inlet. The whole length of the spinal column, especially the *lumbar region*, must be firmly pressed against the couch. All these positions tend to relax the muscles connecting the pelvis and femora, and thereby also dilate the birth-canal. Thus, when the head engages in the *superior strait*, Walcher's position is very useful in difficult labors, On the other hand, when the head is approaching the *outlet*, that is, during its passage through the vulva and over the perineum, the smaller the pelvic angle in the dorsal position the nearer will be the head to the symphysis and the *smaller*, therefore, *the danger of a perineal tear* (Figs. 51, 60).

The *lithotomy* position is to be used in operations on the vulva (perineal tears) or on the anterior fornix; on the vaginal portion of the cervix (suturing lacerations) after a speculum has been introduced (legs flexed on abdomen); and when the head engages in the *outlet*.

Walcher's position is sometimes useful in celiotomies, to facilitate the drawing of a tumor or of the gravid uterus into the operative field. There are certain modifications of this position which also tend to throw the intestines against the diaphragm and bring the pelvic viscera into view, as Trendelenburg's and Veit's positions (the trunk is placed low, either the knees or the pelvis forming the highest part of the body). A knowledge of the influence of these positions may be of great importance in the performance of Cesarean section, Porro's amputation of the uterus, and other obstetrical operations on the abdomen, labor complicated by an obstructing tumor, ectopic gestation, and rupture of the uterus.

FIG. 64. **Superficial Layers of the Uterine Muscle** (after Deville, from the atlas of Lenoir, Sée, and Tarnier): *T*, tube; *P*, portio vaginalis; *Lg.l.*, broad ligament.

FIG. 65. **Deep Layers of the Uterine Muscle** (*Ibid.*).

FIG. 66. Arrangement of the Muscle-fibers (after C. Ruge).

FIG. 67, *a* and *b*. **Decidua Vera Complete** after expulsion (see § 12).

the continuation partly of the inner circular and partly of the outer longitudinal fibers of the tubes. They are thus grouped about two central foci which correspond to the points of origin of the oviducts (Fig. 65). Evidences of the formation of the uterus by the union of Müller's ducts are plainly recognized in this region. The inner layer is the first to develop.

It is not always easy to distinguish these two layers. Formerly three layers were described; the middle portion, being particularly well supplied with blood-vessels, was called the *stratum vasculosum* (Fig. 14).

In order to get a clear understanding of the function of the uterine muscle we divide the fibers into two groups:

The *principal* fibers run lengthwise from the peritoneum to the mucous membrane, traversing the intermediate tissues of the uterine wall more or less obliquely and in a downward direction. These fibers are crossed by the *connecting fibers* which run vertically, the whole forming a succession of rhomboid masses covered as with roofing-tiles by the superincumbent outer layer (C. Ruge's "muscle-rhomboids," Fig. 66). The cross-fibers are derived from the round ligaments, the ovariopelvic folds, the broad ligaments, the sacro-, recto-, and vesico-uterine ligaments, and from the muscular fibers accompanying the blood-vessels.

This *irregular* picture (Fig. 14) of muscle-fibers crossing each other in every direction is seen in the non-pregnant as well as in the puerperal *uterus*. It is the result of the uterine contractions.

The *gravid* uterus, on the other hand—except in the first few months—appears much *distended* in every direction and its walls are correspondingly *thin*. This is because the non-contracting fibers are greatly increased in length[1] without being increased in number (Sänger). They are now all arranged in parallel longitudinal rows, separated by loose areolar connective tissue. Hence the softening first of the uterus and later of the cervix that is so distinctly felt.

The longitudinal distention of the organ is due to the growth of the principal fibers, its increased circumference to that of the connecting fibers.

In expanding peripherally the uterus mechanically displaces the loose connective tissue of the broad ligaments like an intra-

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[1] The length is increased tenfold, the width fivefold.

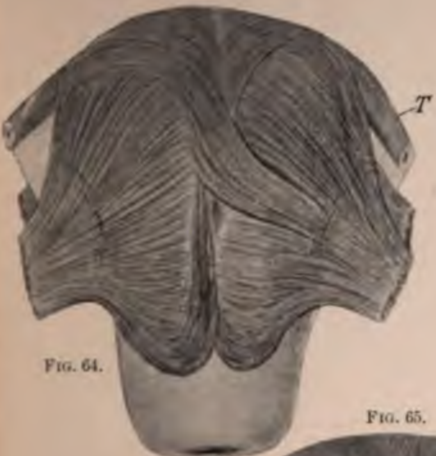

FIG. 64.

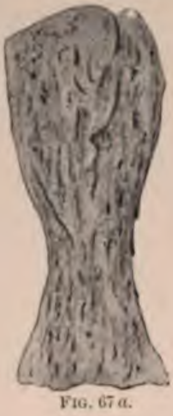

FIG. 67 *a*.

FIG. 65.

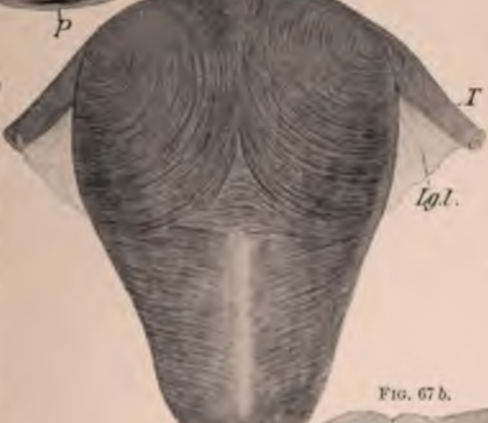

FIG. 66.

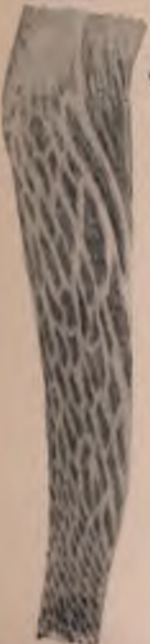

FIG. 67 *b*.

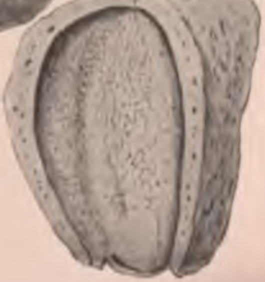

FIG. 64. **Superficia**
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ligamentary myoma, or an intraligamentary tubal pregnancy, or an ovarian cyst: *it grows into the broad ligaments.* The growth is so great at the fundus as to push the adnexa and ligaments far down toward the cervix. The *ligaments do not begin to tighten until the labor-pains come on.* At the beginning of pregnancy the volume of the uterus is to its weight as 1 : 14, toward the end, as 6 : 1 (v. Herff). This is on account of the steady growth of the uterine tissues, which at last, however, diminishes.

During the *puerperium* the muscle-fibers rapidly undergo a granular degeneration. Those nearest the mucosa (decidua) take on a characteristic zigzag shape (see Fig. 87); but they do not return to their original size. Other newly formed fibers are reduced to a minimum size, but remain as a reserve supply. This explains why the uterus after involution is completed is still larger than in the virgin state.

During pregnancy the uterus, like any other muscular organ, possesses a definite *tone;* it is, however, not in a state of uniform contraction, but contracts at regular intervals with such force as almost to compress the organ to its utmost, especially during the latter half of pregnancy, although the contractions are sometimes observed from the beginning of the fourth month. These vigorous contractions make it impossible for the fetus to change its position or even to obey the laws of gravity, especially when labor is near at hand, for the fetal movements are in reality very weak, and only appear strong because the fetus is suspended in the amniotic fluid. Gravity can affect only the pregnant uterus as a whole. The *attitude of the fetus* is determined neither by gravity alone nor by its own spontaneous or reflex movements, but by the *contractions of the uterine muscle* and the "functional ovoid shape" of the uterus. The head, being the most compact and at the same time most movable portion, is the part most readily acted upon; the larger and firmer the head the more easily it is forced into the lower segment, against the internal os, where the muscular layer is least developed and there is, therefore, least expulsive power. At the same time the rest of the body and the extremities, being coiled on themselves, are best accommodated in the broad, oval fundus uteri, which, therefore, contains the trunk, breech, and extremities, while the head occupies the less muscular lower uterine segment. Although the gravid uterus is soft and doughy, and, except during the frequent, imperceptible contractions, represents a flabby, yielding sac, yet the general effect of the regularly recurring contractions is to give it a distinct oval shape and to cause the fetus to assume a corresponding attitude. As the contractions are not always uniform the palpating hand feels the contracting portions now as round, hard masses, now as ridges running lengthwise of the organ.

Distinct "cephalic presentations" are much more rare when either the fetus or the uterus is deformed (uterus unicornis or bicornis, partial inertia uteri), or the head is either abnormally small or enormously enlarged.

The *older* the fetus and the *larger* and *firmer* the head the more *frequent* are cephalic presentations in premature births.

Thus the long axis of the fetal trunk becomes exactly perpendicular to the plane of the inlet or coincides exactly with the long diameter of the uterus and a *cephalic presentation* results. In two-thirds of all cephalic presentations the back is found on the left side of the mother and turns to the left and forward when labor-pains begin. This is called the *first presentation* (L. O. A.). It is due to the fact that the transverse diameter of the uterus, as explained above, usually coincides with the right oblique diameter of the pelvis (*R.*), so that its left border is felt *in front* through the abdominal walls. Another reason is that the lordosis of the vertebral column in the later months of pregnancy prevents the fetal back from falling backward into the right half of the uterus. Until the onset of labor-pains the position of the back, whether anterior or posterior, is determined by gravity and possibly, to some extent, by the weight of the fetal liver; but as soon as labor begins the back is rotated *forward*. Another factor is the site of the placenta.

In funnel-shaped pelves with lumbosacral kyphosis, owing to the absence of lordosis, the first and second presentations (L. O. A and R. O. A.) occur with equal frequency. It is said that among Japanese women the second presentation (R. O. A.) is more common than the first. If, as rarely happens, the uterus is displaced to the left there is every likelihood that the occiput has been rotated backward, or that by a simultaneous torsion on the other side a *second* cephalic presentation (R. O. A.) will result.

LABOR-PAINS AND THEIR EFFECT ON THE FETUS.

In contracting the uterus approaches, as far as the ovum permits, the pyriform shape of the virgin state: it becomes rigid, increases in *length* and *depth*, and meeting the resistance of the lumbar and sacral vertebræ forces the *abdominal walls forward*. The body of the uterus, being a *hollow muscle*, contracts; the *lower uterine segment*—owing to the absence of muscular tissue or in obedience to antagonistic innervation—suffers longitudinal distention. The lower uterine segment, the cervix, and the vagina together constitute the *outlet of the birth-canal.* The cervix and the external os are poor in muscle-fibers, but rich in *elastic fibers.* The latter are arranged in two layers, an outer longitudinal and an inner circular (like the string of a tobacco-pouch), which is distended by the descent of the head, assisted by the contraction of the longitudinal or *retraction fibers*, which are anatomically and functionally connected with the longitudinal fibers of the uterus and with the round ligaments. There is, in fact, a true sphincter, consisting not of muscular but of elastic fibers. The cervical canal and the lower uterine segment undergo during labor a dilatation equal to six times the natural diameter or about 3¼ in. (8 cm.).

The contraction of the hollow muscle and the pressure of the abdominal walls, in combination with the resisting forces described, result in a general *internal pressure* on the fetus. At first the uterus rises about a finger's breadth. The lower portion of the birth-canal, especially the "lower uterine segment," undergoes longitudinal distention. This has the effect of *stretching* the fetus to the extent of about 1¼ in. (3½ cm.), as has been proved by frozen sections; pressure is exerted on the vertebral column of the fetus ("Fruchtwirbelsäulendruck").

It appears to me that this theory of Lahs, while it takes due account of the important and undeniable phenomenon of the stretching of the fetus and the lengthening of the uterus during contraction, neglects that *other force by which the uterus returns to its original flattened, pyriform shape with slight anteflexion.* This force is merely one of the components of the general internal pressure. It is tacitly included in the force which Schatz calls the "restitution-force" ("Formrestitutionskraft") of the uterus.[1]

Intra-uterine pressure, registered in the plane of the inlet by means of a hollow rubber ball introduced into the cervix (after Schatz and Westermark), depends on:

(1) The *abdominal contractions* and accidental intra-abdominal tension, such as gas, etc., forming together the *intra-abdominal pressure;*

(2) On the *difference in level between the pelvic inlet and the highest point of the uterus* (varies with the position of the body; in the dorsal decubitus it is 30 mm. Hg.); and

(3) On the *tension of the uterine walls: volume of contents.*

Intra-uterine pressure diminishes after the membranes have ruptured; it then tends to regain its former height, but is prevented from doing so by the discharge of the amniotic fluid and the descent of the fetus. The severity of the labor-pains is in direct proportion to the intra-uterine pressure. The curve at first rises very slowly, then there is a sudden jump, followed by a second gradual increase, till it reaches its maximum duration of 8.1 seconds. The fall is at first gradual, then more rapid, and *finally very slow, until the ordinate is reached.*

Intra-uterine pressure varies between 20 and 220 mm. Hg. = 4 lb. 6½ oz. and 55 lb. 2 oz. (2 and 25 kilos); the *mean pressure* = 55.6—163.3, or 107 mm. Hg. (according to Schatz the maximum is 100 = 220½ lb. [10 kilos]). The labor-pains increase progressively, being greatest at the end of labor. According to Schatz's tokodynamometer they have a strength of 18¾ to 61½ lb. (8.5 to 27.5 kilos). They travel in peristaltic waves from the tube to the internal os.

This peristaltic movement was observed by Kehrer in animals,

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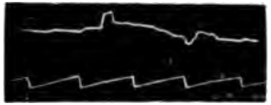
[1] Schatz's theory differed from that of Lahs; he distinguished the "general uterine pressure," the "restitution-force" of the uterus and fetus, and, as a resultant of these two, the "pressure along the axis of the fetus" ("Fruchtachsendruck").

FIG. 1.



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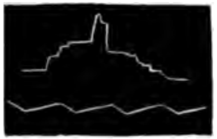
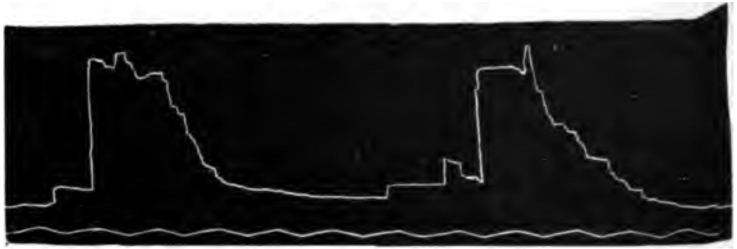


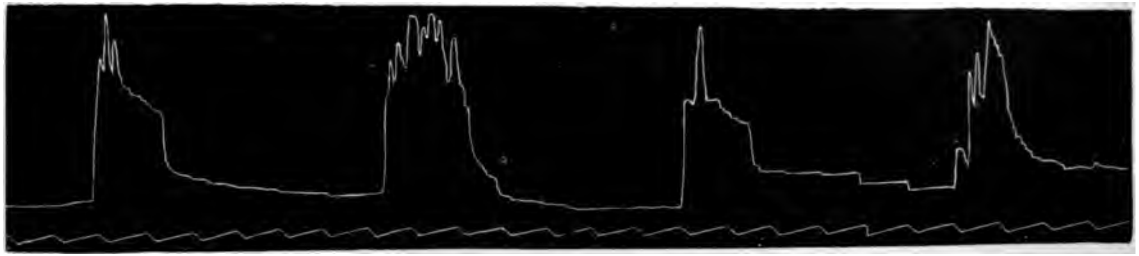
FIGS. 1, 2.—Labor-pains in the beginning and toward the middle of the first stage.

FIG. 4.



Curve with broad apex.

FIG. 3.



Propulsive pains (the last in dorsal decubitus).

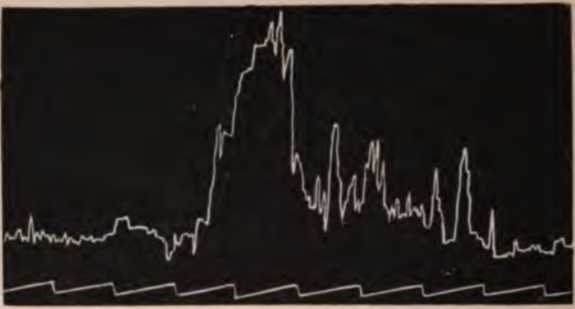
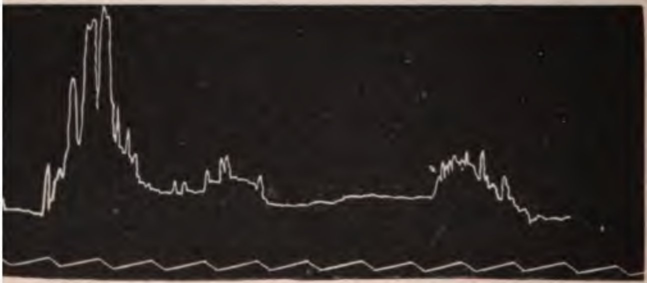


FIG. 5.—Effective terminal bearing-down pain.



G. 6.—Double pain, one a bearing-down pain, followed by an abortive pain.

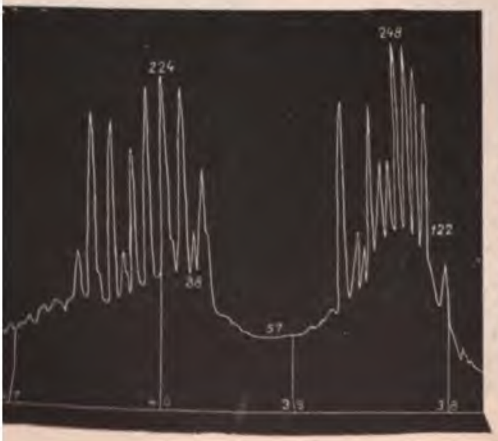


FIG. 7.—Intra-uterine pressure during bearing-down pains (after Schatz, for comparison with the curves after author's method, in Figs. 4-6, 8, and 10).

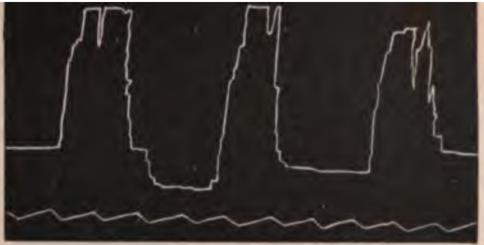


FIG. 8.—Curve with broad apex (third pain from the last).

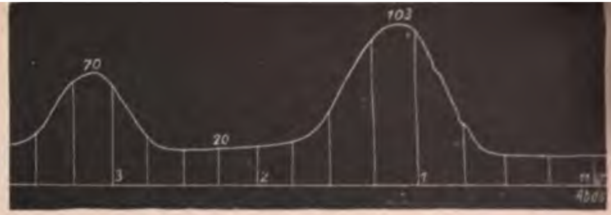


FIG. 9.—Pains in the first stage (see note to Fig. 7).

Last pain in dorsal
decubitus with
bearing down.

Head in vulva.
⟵ Patient placed
in side position.

Bearing down during
interval.

Labor-pain without
bearing down.
⟵ Birth of head.
Bearing down during
interval.

Last labor-pain.

Birth of child

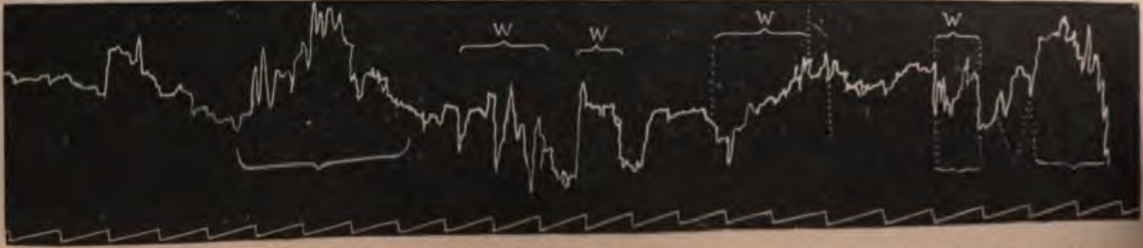


FIG. 10.—Complete labor with and without bearing down, during the pains and in the intervals, in lateral decubitus.

FIG. 68. **Nerve-supply of the Female Genitalia** (modified from Frankenhäuser and Hirschfeld): 1, inferior aortic hypogastric plexus; 2, right inferior mesenteric plexus; 3, lumbar ganglion of sympathetic nerve; 4, ovarian plexus (from renal and aortic plexuses), supplies *tubes, ovaries,* and *fundus uteri;* 5, third and fourth sacral nerves form the right inferior hypogastric plexus with the ganglionic systems 6 and 7, which supply the cervix; 8, *uterine nerves;* the lower part of the uterus is supplied by the inferior hypogastric plexus, the middle portion by the inferior aortic hypogastric plexus, the fundus by the ovarian plexus and filaments from the two last-named plexuses; 9, vesical plexus; 10, sciatic nerve; 11, branch of fourth sacral nerve to *levator ani;* 12, pudic nerve; 13, its continuation as dorsal nerve of the clitoris; *R*, rectum; *U*, uterus; *B*, bladder; *D*, *transversus perinei* muscle (in cross-section); *S*, iliac bone; *P*, *os pubis; Ur*, ureter; *Ao*, aorta; *V*, vagina; *La*, *levator ani* muscle; *Ov*, ovary; *T*, tube.

FIG. 69. **Muscles of the Perineum** (original drawing, modified from Savage, with corrections): 1, *gluteus maximus;* 2, *levator ani;* 3, *sphincter ani;* 4, *obturator externus;* 5, *tubera ischii;* 6, *ischiocavernosus* and *erector clitoridis;* 7, *constrictor vaginæ;* 8, coccyx; 9, symphysis and suspensory ligament of the clitoris; 10, gland of Bartholin; 11, anus; 12, vagina; 13, urethra; 14, the connective tissue and fascia shown in Fig. 30, 6, 7; 15, great sacrosciatic ligament.

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loss of blood, by an *excess of* CO_2 in the general circulation, by *high, febrile temperatures*, by quinine, sodium salicylate, ergot, and other poisons (strychnine), and by experimental irritation of the *ovarian nerves* belonging to the ovarian plexus (formed by branches of the renal and aortic plexuses) and functionally connected with the uterus and uterine plexus by means of the two ovarian ganglia. The entire sympathetic system of the genital organs can be traced back to the celiac ganglion, which, as is well known, contains fibers from the vagi. Lastly, labor-pains may be excited by direct *irritation of the uterus;* this acts reflexly, hence the resulting pain induces the contractions which follow; on the other hand, uterine contractions may also be induced by *independent* centers in the uterus, without the intervention of the central nervous system (Fig. 68). There is also a reflex communication between the mammæ and the uterus.

The uterine nerves are most irritable at the end and at the very beginning of pregnancy; during the entire

Tab. 31.

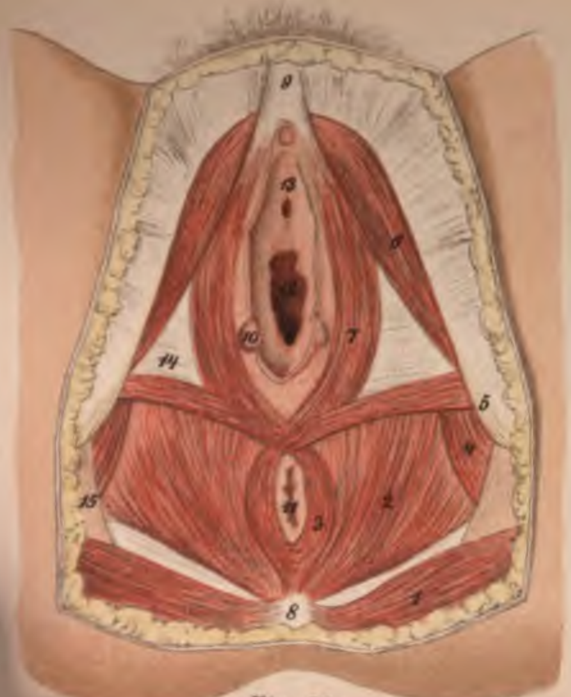

Fig. 69

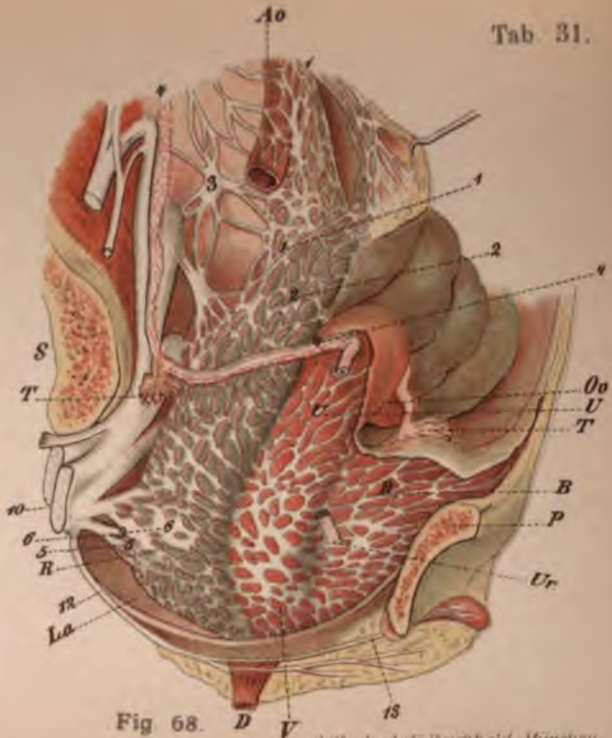

Fig. 68.

Lith. Anst. F. Reichhold, München

period they are thickened by an overgrowth of connective tissue. It has been experimentally proven that conception and parturition are possible after complete destruction of the lumbar cord. This has even been observed in women after all connection with the higher portions of the cord and the cerebrum had been severed, as in paraplegia, echinococcus, neoplasm on a thoracic vertebra, etc. The innervation is probably derived from Dembo's centers. The uterus itself contains no ganglia, but numerous cellular elements of various shapes are found embedded in a network of sympathetic fibers anastomosing with them and with each other. In addition to and separate from these there are long medullated cerebrospinal fibers running through the uterine substance.

The sensory nerves of the vagina and vulva also participate in the act of parturition, as in other generative processes, by virtue of their influence on labor-pains and on the musculature of the vagina. These parts are supplied by the pudic nerve and its branch to the clitoris; irritation of them is followed by engorgement of the vessels of the cervix, vagina, and vulva (through the inferior hypogastric plexus), and by contraction of the *constrictor vaginæ*, *levator ani*, and all the muscles that enter into the formation of the pelvic floor (through the sacral nerves), and play such an important rôle during the passage of the presenting part.

§ 6. THE FIRST OR DILATATION STAGE OF LABOR. BEHAVIOR OF THE LOWER UTERINE SEGMENT AND OF THE CERVIX DURING THIS PERIOD.

As a rule, the cervix takes no part in the support of the ovum during pregnancy; at most some decidual cells may be found a few millimeters below the internal os, hence the body of the uterus proper only is adapted to the reception of the ovum. The entire cervix remains unaltered until the onset of labor, the shortening of the vaginal portion being the only apparent change, as shown in § 2. In the cases in which, owing to slight dilatation of the (anatomical) internal os, the portion immediately below it becomes the seat of decidua-formation, the boundary of the cervical mucosa is marked by a slight thickening, known as Müller's ring. In primiparæ, however, the internal os and the upper portion of the cervical canal do, toward the end of pregnancy, participate in the dilatation of the lower uterine segment.

With the onset of labor-pains the muscularis of the body of the uterus contracts over the child in a direction toward the fundus, so that a propulsive force is exerted along the longitudinal axis of the child toward the true pelvis, except in transverse presentations. But, since the child is propelled forward, the uterine muscle must find a *point d'appui* in the maternal body as soon as the presenting part meets with resistance, as at the brim, at the rectum distended with feces or at a distended bladder, at the iliacus and psoas muscles, at the surfaces of the acetabula, at the spines of the ischium, at the levatores ani and constrictor vaginæ, at the coccyx, at the perineum, and at the symphysis.

When the uterus is forcibly contracted to overcome abnormal resistance, such as that offered by a contracted pelvis for instance, this line of fixation must coincide with the lower boundary of that portion of the genital tube which suffers the greatest longitudinal distention when the contracting force of the fundus is exerted; [that is to say, the lower uterine segment, as will appear in the next paragraph.—Trans.]

The recently evacuated uterus[1] of a woman who has died during childbirth presents two distinct divisions: the contracting uterine body with thick walls, and a thinner portion extending to the external os. The pregnant contracting uterus, before dilatation of the internal os[2] has occurred, presents three more or less distinct zones: the contracted upper part of the body; a distended lower

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[1] Braune's frozen section of a parturient woman (Fig. 4, in *Atlas of Obstetrics*, I., modified) in the second stage of labor; Schröder's specimen of a woman just delivered (1886).

[2] Schröder-Stratz (1886), frozen section.

portion, the so-called "lower uterine segment," about 2¾ in. (7 cm.) in length, extending to the internal os; and the intact cervical canal. The lower boundary of the contracting zone of the fundus is marked by a ridge of thickening, the "contraction-ring," which, however, can rarely be distinctly recognized as a persistent element even in the living subject, and practically never in the cadaver. It follows that the entire genital canal below the contraction-ring undergoes lateral distention during labor, while true longitudinal *distention* can take place only in the above-mentioned region, extending from the internal os to the contraction-ring; this part of the uterine body is, therefore, the true "lower uterine segment." It is stretched by *traction*, while the cervical canal and vagina, with ordinary or slightly increased resistance, represent the dilated portion of the birth-canal, that part which is simply thinned by the *pressure* on its walls from within. But under abnormal conditions of resistance this latter portion may partially assume the character of a distended segment; in other words, in forced contractions the genital canal seeks a deeper point of fixation. The first or upper point of fixation is found, as we have shown, in the region about the internal os; the manner of its attachment will be studied later. What, then, is the second more deeply situated point of fixation?

Among the many specimens of rupture of the uterus in the Munich Gynecological Clinic the line of rupture in most cases was longitudinal or oblique, or in the form of a transverse tear with a long triangular flap pointing downward, beginning above at the contraction-ring and ending below at a point ⅕ to ⅘ in. (0.5 to 2 cm.) above the external os (see Fig. 16 in the text). In some of the specimens the tear is continued directly into the vagina, but more frequently it ends at the above-mentioned point in the cervical canal, leaves the os intact, and is then continued into the vaginal vault. It is evident, therefore, that there are three "lower points of fixation": (*a*) at the level of the cervix, *i. e.*, at the internal os, under normal conditions; (*b*) about $\frac{1}{5}$ to $\frac{4}{5}$ in. (0.5 to 2 cm.) above the internal os (in puerperal specimens) when the pressure is abnormally increased; (*c*) in the vaginal vault.

These phenomena find a partial explanation in the anatomical structure of the parts. In (*a*) fixation is effected by the muscular fibers and thick, tendinous bundles of connective tissue, which are found partly in the retro-uterine peritoneal folds of Douglas and partly in the lower, basal portions of the broad ligaments, from the level of the internal os downward as far as the fornix, enclosing the genital canal and fixing it to the pelvic wall. These glistening, tendinous bands of connective tissue constitute what is known as the *ligamentum cardinale* (Kock), and merge into the sacrorecto-uterine and pubovesico-uterine ligaments and the tissues forming the lateral walls of the pelvis (see Fig. 75).

Above the cross formed by these ligamentary bands the uterus is loosely attached to the adjoining organs by areolar tissue, such as is found under a serous surface; it lies beneath that part of the serous membrane which lines the vesico-uterine and recto-uterine fossæ in front of and behind the uterus, the lateral portions forming part of the broad ligaments. The latter represent the mesentery of the internal sexual organs; during pregnancy their bulk is much increased by the hyperemia of the vascular system. In the same way the peritoneum increases in thickness and extent in all parts of the genital tract, both by virtue of its elasticity and power of adapting itself to the uterus and by actual cell-proliferation. The peritoneum extends from the bladder to the internal os or a little higher, forming the excavation bounded by the vesico-uterine folds. Below the peritoneum the connection between the uterus and bladder is maintained by loose connective tissue.

The body of the uterus is, therefore, covered by peritoneum, forming the closely adherent "perimetrium," which is continued to the pelvic walls on each side as the broad ligament. The upper border lodges the oviduct, covered by a duplicature of the membrane which is continued to the *linea terminalis* as the suspensory ligament of the ovary (infundibulopelvic ligament). The ovary and parovarium occupy the posterior surface of the broad ligament, but are not completely enclosed by it. The loose connective tissue and the blood-vessels are found between the two serous layers. The infundibulopelvic ligament arches backward to the brim of the pelvis, where it is inserted above the bifurcation of the common iliac artery. From this point the broad ligament sweeps forward and backward and descends with the hypogastric artery.

In close relation with the hypogastric arteries are found the ureters, which describe a curve with its convexity outward and backward, and descend obliquely from without inward and from behind forward to the base of the broad ligament. The left ureter is near the median line, but the right is nearer the internal os ($\frac{3}{4}$ in. = 19 mm.), on account of the dextroposition of the uterus from the pressure of the rectum; it is only $\frac{3}{8}$ in. (8 mm.) from the supravaginal portion of the cervix and $\frac{1}{4}$ in. (6 mm.) from the vaginal vault. At a point $\frac{5}{8}$ in. (15 mm.) lower down the ureters are found on the anterolateral wall of the vagina, which they cross at an acute angle.

The peritoneum leaves the posterior surface of the uterus at about the level of the internal os, after forming at this point a thickened ridge (Figs. 29, 32), which contains numerous muscle-fibers and is continued into the sacro-uterine and recto-uterine folds of Douglas. These fibers form the so-called *retractores uteri* of Luschka. Immediately below is the attachment of the above-described intersecting ligaments, the lateral portions of which also contain smooth muscle-fibers.

The peritoneum dips down $\frac{2}{5}$ to $\frac{4}{5}$ in. (1 to 2 cm.) below Douglas' folds into the recto-uterine or Douglas' pouch, as far as the posterior fornix (hence lower than in front), and from this point is reflected back over the rectum and to the posterior pelvic wall.

Beneath the peritoneum of the broad ligament the round ligament forms a distinct ridge, which passes on either side from the junction of the tube downward, forward, and outward through the inguinal canal. Here it receives a tubular extension of peritoneum, the *canal of Nuck* (*processus vaginalis peritonealis*). Emerging from the external abdominal ring it passes to the mons veneris, where it receives striated muscle-fibers from the internal oblique. The uterine extremity contains smooth muscle-fibers. During pregnancy the round ligament enlarges to the thickness of a finger, partly from increase of the muscular portions. As the uterus rises above the inlet the course of the round ligaments and of the oviducts approaches the perpendicular, although the fundus still *arches over far above them.* During parturition the ligaments are stretched and the left one is easily palpated, as the uterus rotates into the right diagonal.

From the foregoing description it follows that the space on either side of the uterus, as far down as the internal os, contains only a loose, non-resistant connective tissue, while below the internal os, as far as the fornix, is attached the more resistant *ligamentum cardinale*, containing muscular fibers and forming the *first point of fixation* mentioned under (*a*), in the longitudinal extension of the lower uterine segment.

At the *second point of fixation* (*b*), $\frac{1}{5}$ to $\frac{4}{5}$ in. ($\frac{1}{2}$ to 2 cm.) above the external os in the cervix, the tension increases until the bridge of tissue connecting the vault of the vagina with the nearest point of the cervix is stretched to the utmost; the resistance is then supplied by the walls of the fornix, which are fixed by the closely adherent peritoneal fold at the deepest part of Douglas' pouch (Figs. 17, 18, 27). Hence, if the uterus ruptures, the tear either extends to the above-mentioned point in the cervix nearest the fornix, $\frac{1}{5}$ to $\frac{4}{5}$ in. ($\frac{1}{2}$ to 2 cm.) above the external os, or it passes from this point directly into the vault of the vagina (the external os may or may not escape), since the latter, like the cervix, is quite firmly supported by tendinous bands of connective tissue extending in all directions, especially to the sacrum; the vault of the vagina then corresponds to the *third point of fixation* which we have designated (*c*).

But neither the fact that the cervix and vagina have a common mode of fixation nor their close anatomical relation suffices to explain why these two structures are usually torn to the exclusion of the external os; a third and very important reason is that both are subject to the same muscular pull, since the greater part of the cervical fibers *pass directly over the fornix and blend with the longitudinal fibers of the vagina.*

Lastly, the position and direction of the tear depend on the position of the presenting part, over which the attenuated uterine wall is stretched.[1] By the counter-pressure of a second force the original simple traction is converted by leverage into a more powerful resultant.

There are several reasons why it is *a priori* doubtful whether fixation takes place at any deeper points[2] when the head forcibly engages in the superior strait. In the first place the advancing head wedges the walls of the parturient canal fast at the inlet (thus, the fold in front of the head seen in Braune's frozen section of a parturient woman is, I think, due to the relaxation of the previously contracted tissues, cf. Pl. 49); then the vagina, following the line of the parturient canal, is concave forward, and this curve would first have to be reduced before the structure could take part in the longitudinal distention; and finally, after the largest diameter of the head has passed the inlet, the presenting portion is only at the level of the spines of the ischium, that is to say, the greater part of it is still within the cervical canal, *above* the point (*c*), which marks the fixation-point of the vagina. As a matter of fact such lacerations of the vagina never occur as a result of excessive longitudinal distention, even when the resistance is situated lower than the inlet. Thus, in funnel-shaped pelves, where the contraction is situated at the outlet, vaginal tears occur only from circumscribed pressure-necrosis or from violence.

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[1] Among 100 cases of total rupture of the uterus with complete escape of the child, I found 43 anterior, 17 posterior, 11 lateral. The remainder were due to violence, old Cesarean scars, myoma-insertions, etc.

[2] Such fixationis afforded by the constrictor vaginæ and levator ani muscles, which serve to prevent total prolapse in the highest degree of inversion of the uterus with inversion of the vagina (see Fig. 30).

The "lower uterine segment" then exists as such as early as the first half of pregnancy. According to some authors (Hofmeier, von Franqué, Ruge, Veit) it exists as an anatomical structure even in the virgin state, the above-mentioned authors basing their belief on the relation of the anterior peritoneal attachment and of the uterine vessels to the contraction-ring. There is an active growth in this region during pregnancy. The internal os must be regarded as the lower boundary of the "lower uterine segment"; this view, it seems to me, finds further support in the fact that decidua formation ceases at this point; in the fact that the internal os remains closed until the onset of labor; and especially in the fact that on this assumption the *inferior* fixation of the uterus in an obstetrical sense takes place at this point. The contraction-ring which forms the upper boundary must also be considered an anatomical part of the body of the uterus, but its shape and significance are brought out only by the contraction of the muscularis of the fundus and body; it is conspicuous in direct proportion to the number of muscle-fibers in the uterine walls above the internal os and the strength of the contractions. The cervix contains few muscle-fibers and, therefore, does not contract; on the other hand, it suffers little or no elongation during pregnancy, and the increase in thickness is due more to edematous swelling and relaxation of the tissues than to an increase in the muscle-fibers. It follows that the upper limit of the "lower uterine segment" depends on the function of the muscularis, and we should expect to find it in this structure at the point where the muscle-fibers, in respect to number and arrangement, begin to assume the character of the muscularis at the fundus. This zone coincides approximately with the line of attachment of the anterior perimetrium and the entrance of the uterine artery. This definition will be found in the 1894 edition of this Atlas; v. Herff adopted the same view in 1897; and v. Dittel in 1898 was forced to the same conclusion by his histological investigations. It is for this reason that the contraction-ring, representing as it does a function which ceases with life, is so rarely seen in the cadaver. When v. Herff found it in a Cesarean section he described it as a "contraction-phenomenon," which, as such, is of the greatest practical significance.

So far we have considered only the anatomical characters of the parturient canal. In regard to the fetus and the part it plays in the process we now know the following facts: (1) The trunk suffers extension during the uterine contractions; (2) it presents a *point d'appui* to the fundus which rises above it as it contracts; (3) the advancing head, even before the onset of labor, follows the line of least muscular resistance and is pushed into the "lower uterine segment."

During the dilatation stage the head burrows down into the anterior wall of the lower uterine segment, which it pushes before it into the vault of the vagina. A part of its advancing segment is, therefore, deeper than the internal or even the external os. In a normal birth the bag of waters is still intact at this stage, and as it is forced into the cervical canal dilates the latter completely. But if the membranes are ruptured prematurely, the dilatation of the cervix must be effected by the hard, unresisting head, and is accordingly more painful; besides, the head becomes much more firmly fixed by adhesion in the anterior, bulging portion of the "lower uterine segment." This may give rise to disturbances of the circulation, edematous swelling of the tissues about the os, and partial contraction-spasms. The dilatation of the cervix is heralded during the latter part of pregnancy by a softening of the walls progressing from above downward.

If the inlet is contracted, the muscularis of the fundus, on the one hand, is unable to force the head into the inlet, and the cervix, on the other hand, being wedged in and held fast by the head, cannot respond to the upward pull of the uterine muscle. In such cases the above-described tendinous ligaments, which surround the cervix and vagina, do not come into action at all, the lower uterine segment is held fast by the head itself and is stretched upward; it gives way at the point where the tension is greatest, *i. e.*, opposite the vault of the cranium.

To sum up the function of the "lower uterine segment," it forms that part of the uterus which receives the presenting part (head) of the fetus and allows it to descend at the onset of labor. The effect of this is that the cervical canal is at the same time directly dilated by the advancing membranes, or, if the latter have ruptured prematurely, indirectly by the pull of the uterine walls and the pressure of the head on the anterior, bulging portion of the "lower uterine segment." The latter can perform its office only when its contractile power, or in other words, its muscular development, is much less than that of the fundus. Hence, it begins where the muscularis of the fundus ends; when the organ is firmly contracted the thickness of the walls diminishes abruptly,

§ 7. THE SECOND STAGE (STAGE OF EXPULSION) AND THE RESISTANCE OFFERED BY THE PELVIC PLANES AND THE FLOOR OF THE PELVIS.

We saw in § 3 that the largest diameters in each of the pelvic planes do not run in the same direction. At the inlet the transverse diameter is the largest; when the head, therefore, engages in the true pelvis its greatest diameter, the occipitofrontal, coincides with the transverse diameter of the brim; the sagittal suture is felt in the transverse diameter and, since the latter lies nearer the sacrum (see Fig. 70), the sagittal suture in at least one-third of the cases is found to be nearer the promontory. This is known as *Nägele's obliquity*, or presentation of the anterior parietal bone. If the advancing part is not oval like the vertex, but more spherical like the face or the breech, the longest diameter is forced away from the promontory and coincides with the oblique diameter of the inlet; the same thing occurs in vertex presentations (*Solayrès obliquity*) in rare cases with complications. The size of the inlet is further diminished by the iliopsoas muscles, in addition to the pelvic viscera, and the greatest transverse diameter is thereby displaced slightly forward toward the symphysis. These muscles can be relaxed by flexing and supporting the legs (Figs. 60, 61, 70).

The second plane is the plane of pelvic expansion, passing through the middle of the *third* sacral vertebra and the middle of the symphysis; the oblique is its largest diameter, hence the sagittal suture rotates into it; the lesser fontanel can usually be felt at the anterior extremity of the oblique diameter. This is the *second rotation* of the head; the *first rotation* occurs when the smallest or suboccipitobregmatic circumference of the head descends into the funnel-shaped pelvis, and is effected by flexion of the head on the chest, assisted by the uniform contraction of the uterus and the tilting due to the pressure of the vertebral column on the condyles. The oblique diameter of the plane of pelvic expansion is con-

FIG. 73. **Skull of a Child at Term** (side view; from an original photograph): *o.-fr.o.*, straight or fronto-occipital diameter, corresponding to the fronto-occipital distance or circumference; *o.mj.* and *o'.mj.*, major oblique diameter, according as the most distant posterior extremity corresponds exactly with the lesser fontanel or lies above it; *G.L.*, the largest circumference of the head that has to pass in face presentations (the anterior extremity is the larynx); *s.oc.-s.a.br.*, minor oblique diameter, corresponds to the suboccipitobregmatic distance and circumference; *B.L.*, the largest circumference that passes in occipital presentations, does not quite correspond to the suboccipitobregmatic circumference; F.R.[1] and F.R.,[2] the two largest circumferences that pass in brow presentations, according to the method of delivery. The frontal, lambdoid, and temporal sutures and the two temporal fontanels are seen.

FIG. 74. **The Same, Seen from Above** (from an original photograph): *tr.mj.*, major transverse or biparietal diameter; *tr.mi.*, minor transverse or bitemporal diameter. The greater or anterior fontanel; quadrilateral, formed by four sutures: the frontal, the two coronary, and the sagittal, which leads to the lesser, triangular or posterior fontanel, and joins the lambdoid sutures. The radiating structure of the parietal and frontal bones and their junction with the parietal and frontal eminences, also the junction of the occipital bone (squama occipitis) with the occipital protuberance, are important from an obstetrical point of view.

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siderably shortened by the pyriform and obturator internus muscles, but is nevertheless elastic, as the posterior boundary is not formed by bone and the anterior is partly supplied by the obturator membrane (Fig. 72).

There is a certain developmental relationship between the size of the fetal skull and the maternal pelvis. The size of any individual skull is, of course, influenced by certain hereditary factors derived from parents and grandparents, and particularly by conditions influencing the mother during pregnancy and the father at the time of impregnation (diseases, nutrition, etc.). The nutrition of the child bears a direct relation to the size and hardness of the bones of the skull and the smallness of the fontanels, and hence, also, to the body weight and the size and hardness of the head. A certain relationship also exists between the weight of the child and the weight and age of the mother. According to the author's statistics mothers between the ages of twenty and twenty-nine years of age and weighing over 121 lb. (55 kgm.), especially multiparæ, produce relatively the heaviest children, and by far the greater number of them are boys. The head of a child at term is about six-tenths the size of the mother's in all its dimensions, but it is not a miniature of the mother's head.

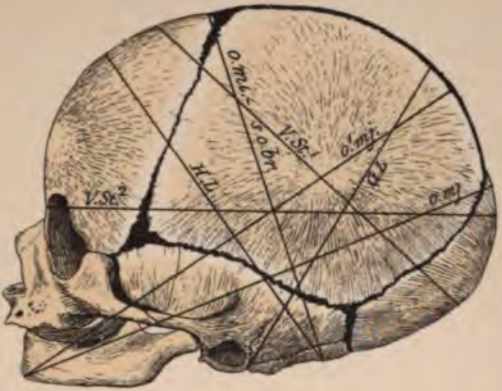

Fig. 73.

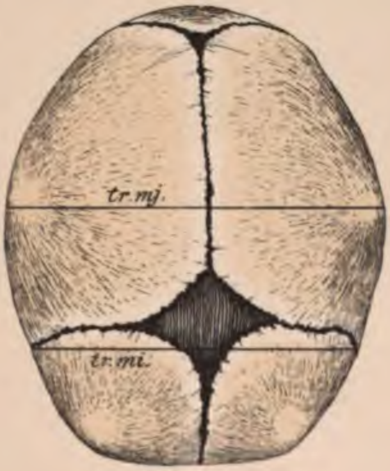

Fig. 74.

Lith. Anst. F. R.

In multiparæ the later children have larger (⅛ to 3/10 in. = ½ to ¾ cm. in every diameter) and firmer heads than the earlier ones.

The skull of an infant at term has the following average dimensions:

Suboccipitobregmatic circumference, 12¾ in. (32 cm.) (passes in the ordinary occipital presentations).

Fronto-occipital circumference, 13⅝ in. (34 cm.) (passes in occipital and brow presentations).

Mentofrontal circumference, 12¾ in. (32 cm.) (passes first in face presentations).

Submento-occipital circumference, 14¾ in. (36¾ cm.) (passes last in face presentations).

Fronto-occipital diameter, 4¾ in. (12 cm.) (glabellà to external occipital protuberance).

Biparietal (major transverse) *diameter*, 3¾ in. (9¼ cm.) (between the two parietal eminences).

Bitemporal (minor transverse) *diameter*, 3⅛ in. (8 cm.) (between the two temporal fontanels).

Mento-occipital (major oblique) *diameter*, 5⅜ in. (13½ cm.) (from the chin to the farthest point on the occiput).

Suboccipitobregmatic (minor oblique) *diameter*, 3¾ in. (9½ cm.) (from the nape of the neck to the greater fontanel).

Vertical diameter, 3¾ in. (9½ cm.) (from the vertex to the foramen magnum).

During intra-uterine life the fetal skull increases in width and the non-ossified portions—sutures and fontanels—diminish. As early as the fifth month the right parietal bone is flatter than the left. This phenomenon depends on a physiological difference in the growth of the entire right half of the brain, as the author has found fossæ and hemispheres on the left side larger than on the right as early as the fifth month. This observation is an interesting addition to the chapter on "right-handedness." It is also interesting to note that in the first or commonest vertex presentation (L. O. A.) the flattened right side of the skull exactly fits the outline of the pelvic inlet, which is normally somewhat flattened on the right side. As the left half of the pelvis is usually somewhat larger than the right, that is, the first or right oblique diameter is the larger, so the first vertex presentation (L. O. A.) is the most common. Whenever the oblique diameters were perfectly symmetrical, the pelvis was found to be unusually small; when, on the contrary, the left oblique diagonal was the larger, the pelvis was unusually large, especially in the anterior transverse diameter (iliopubic distance). The second vertex presentation (back on the right side, lesser fontanel in front and to the right, R. O. A.), it is true, is more common when the left oblique diameter is the larger, but, as the entire pelvis is larger, this relation is not so constant as the contrary one.

The skull adapts itself to the shape of the pelvic canal during labor by the movements of its bones on each other. It is most important to bear this in mind. The greatest changes take place in the transverse diameters, which are diminished by twice the width of the sagittal, frontal, and coronary sutures; these sutures are several millimeters wide.

The compression takes place in such a way that the edges of the right parietal bone, which (in the first vertex presentation, L. O. A.) is the deepest and most anterior part of the head, overlap all the others, while the left frontal bone, which is the most posterior part (toward the sacrum), is depressed, that is to say, overlapped by all the adjoining bones. The left parietal and right frontal bones occupy an intermediate position between these two. The fontanels also play an important rôle in the compression of the head. The total diminution in size amounts to from $\frac{3}{5}$ to $\frac{4}{5}$ in. ($1\frac{1}{2}$ to 2 cm.), especially if the flexibility of the parietal bones is taken into account. The posterior frontal bone becomes slightly flattened by the pressure of the promontory. As the transverse diameters are diminished there is a corresponding elongation in the sagittal direction, and here again there is a difference in the two sides. Corresponding to the greater curve of the right iliopectineal line the anterior right parietal bone, in the first vertex presentation (L. O. A), bulges more outward, while the left, which is nearer the sacrum, is pushed forward toward the frontal bone. Hence the movement of the two halves of the skull on each other is asymmetrical: the right half moving more backward, and the left forward.

The part which is the most advanced during labor is drawn out to a point and forms the apex of a cone, the base of which corresponds to that plane which passes first (cf. the explanation of Fig. 73); thus, in the first vertex presentation (L. O. A.), the suboccipitobregmatic circumference forms the base of a cone, the apex of which is the angle of the right parietal bone, which is in contact with the occipital bone and the sagittal suture. This explains the situation of the caput succedaneum and of cephalhematoma, which are caused by the pericranium, together with the skin, adhering to the maternal soft parts and becoming separated from the skull during the intervals between labor-pains (Fritsch).

The distortions of the head during labor in vertex presentations consist not so much in measurable changes in the length of the head, as in a flattening of the region about the brow and anterior fontanel, an arching of the presenting parietal bone, and, in protracted labors, a more vertical position of the squamous portion of the occipital bone.

According to the author's observations these deformities disappear after twelve or, at most, twenty-four hours. If the deformity was more serious, three to four days were required. In the case of presentation of the occipital bone it appears probable that the deformity may persist for several weeks, and even in a modified form throughout the individual's life. In face, brow, and even in anterior fontanel presentations, the deformity is unquestionably permanent if there is marked contraction of the birth-canal. The condition can be determined only by making a cast of the head; measurements are unreliable.

In our discussion of the influence exerted by the different pelvic planes on the advancing head we had reached the plane of pelvic expansion. As a matter of fact, the widest part of the pelvis is *Veit's principal plane* (Fig. 71), which passes through the lower border of the symphysis, parallel to the inlet. It forms a broad, almost circular oval, being but little encroached upon laterally by the iliacus and psoas muscles. The anterior boundary is very yielding, being formed by the broadest part of the obturator membrane and a thin layer of the obturator internus muscle. At this point the head, which is now entirely within the cervical canal, the os being fully dilated (3¼ to 4 in. = 8 to 10 cm.), begins to rotate so that the sagittal suture coincides with the oblique diameter, while at the same time the presenting part of the cranium (after the membranes have ruptured) begins to dilate first the muscular tissues of the vagina and then the pelvic floor. The head now comes in relation with the pubic arch, which is the least resistant portion of the birth-canal and plays such an important rôle in the second rotation of the head and the passage of the vertical diameter. The head is guided toward it by the resistance offered to the advancing parietal bone by the levatores ani muscles and the tissues forming the pelvic floor (Fritsch). From above downward the transverse diameters of the pelvis progressively diminish, while the anteroposterior diameters increase.

After the os is completely dilated the bag of waters usually ruptures immediately and the head advances with its largest diameter into the dilated os, occupying the interspinal line or pelvic strait of greatest pelvic contraction (Fig. 72).

The significance of this plane of the pelvis rests on the following considerations: 1. Its conjugate, which measures $4\frac{5}{8}$ in. ($11\frac{1}{2}$ cm.), is much less extensible than is that of the outlet, which increases from 4 to $4\frac{3}{4}$ in. (10 to 12 cm.), owing to the mobility of the coccyx. 2. It contains absolutely the shortest diameter of the entire pelvis, the interspinal line. 3. The external os and the advancing segment of the head can be palpated in this plane as soon as the largest diameter of the head has entered the true pelvis and the external os is dilated to from 2 to $3\frac{1}{4}$ in. (5 to 8 cm.). This is of the greatest diagnostic importance, for it shows that the largest diameter of the head has passed the inlet. The head is firmly wedged in the pelvis and cannot be pushed upward for the purpose of performing version.

By the expulsive action of the uterine contractions (labor-pains) reinforced by the abdominal muscles, and the resistance of the coccyx and perineum (see Fig. 48), the spine of the ischium acting as the fulcrum, the head now rotates forward under the pubic arch. This rotation of the sagittal suture into the conjugate of the outlet, the contraction of the abdominal muscles, and the bulging of the perineum characterize the second stage or stage of expulsion; the head is in the vagina.

From this time expulsion is effected chiefly by the action of the abdominal muscles; the uterine contractions still continue, however, and excite the abdominal muscles reflexly to contraction. The innervation is complicated, being contributed by both the sympathetic and the spinal system.

The inferior strait consists really of two diverging planes: the "posterior diaphragm of the pelvis," between the coccyx and the tuberosities of the ischium, and the "anterior diaphragm," connecting the bones of the pubis and including the rima pudendi. The pelvic outlet opposes but little resistance except in funnel-shaped pelves and in cases of anterior luxation of the coccyx. Much more importance, from the obstetrician's standpoint, attaches to the muscles between the tip of the coccyx, the tuberosities of the ischium, and the lower border of the symphysis, which make up the pelvic floor and perineum, and form a sphincter-like support for the rectum, vagina, and urethra.

The coccygeus muscle passes from the tip of the coccyx and somewhat laterally forward on either side to the tuberosity of the ischium. The sphincter ani also passes forward from the coccyx to surround the rectum and vagina, making about eight turns, and after being reinforced by fibers from the *transversus perinæi* forms the constrictor vaginæ and inserts into the symphyseal synchondrosis. The *levator ani* arises on the pubis, near the symphysis, and passes to the spines of the ischium—its fibers blending with the tissues of the vagina,[1] which it crosses at a right angle—to the rectum and to the coccyx (Figs. 29 and 30). The fibers of the *ischiocavernosus* insert into the clitoris. The superficial and deep transversus perinæi muscles lie in the same plane and cover the floor of the pelvis between tuberosities of the ischium, or the adjacent portions of the ascending rami of the pubes. These muscles are, therefore, higher, that is, nearer the interior of the pelvis.

The interlacing muscular bands form spaces which are bounded by fasciæ or bands of connective tissue firmly adherent to the

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[1] As the connective tissue which unites the fibers of the levator ani with the vagina is loose, the contraction of the muscle is not sufficient to raise the vagina, but merely compresses it and carries it slightly nearer the anterior wall of the pelvis. When the vulva is distended these muscles impart a similar downward and forward movement to the head.

FIG. 75. **Transverse Section of the Pelvis at the Level of the Internal Os** (modified from Freund): *Six* robust bands of connective tissue radiate forward (*Lg. v. u.*) to the bladder (*V*), laterally along the base of the broad ligaments (*Lg. l. d. et s.*) to the pelvic wall (*Isch.*), and backward (*Lg. r. u.*) to the rectum (*R.*) and sacrum (*S.*). These bands are accompanied by bundles of smooth muscle-fibers. The intervals between the ligamentary bands are occupied partly by loose connective tissue and partly by the pelvic fossæ. Close to the walls are found the pyriformis (*Py.*) and obturator internus (*obt.*) muscles; *C. U.*, cervix uteri; *P.*, os pubis.

FIG. 76. **Rupture of the Cervix and Vaginal Fornix,** without involvement of the external os, illustrating § 6 on the attachments of the uterus and of the vaginal vault, and their influence on the direction of the line of rupture (original drawing from a preparation in the Munich Gynecological Clinic).

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muscles. The subperitoneal cavity of the pelvis (deep perineal interspace) as far as the pelvic floor and levatores ani muscles is filled with fat and areolar connective tissue, which communicates by means of open spaces with the ischiorectal or subcutaneous fossa. Communication is also established through the great sciatic notch and along the pyriformis and obturator internus muscles with the external connective tissue of the pelvis; by means of the round ligaments with the tissues forming the mons veneris; and by means of the pubovesico-uterine ligament at the sides of the bladder with the abdominal walls.

A knowledge of these anatomical relations is important not only in connection with the mechanism of labor and the attachments of the pelvic organs, but also to explain the course of suppurative parametritis and paravaginal inflammation along the line of least resistance.

Embedded in these masses of yielding tissue are the bladder and urethra, the rectum and the *vagina*. The highest portion of the latter, corresponding to the fornix, derives additional support from the robust ligaments which hold the cervix in position. Lower down the levatores ani muscles embrace the vagina, which extends from the external os to the edge of the hymen. This marks the limit of the characteristic stratified squamous epithelium which first appears in the sixth month of fetal life; the upper layer is horny, the next succeeding ones consist of swollen but vigorous (transitional) epithelium in process of transition from the columnar to the cuboid variety. In the vaginal portion of the cervix and in the vagina these epithelial cells in vertical section form a characteristic design of squares, lodging narrow stroma-papillæ carrying blood-vessels. The individual cells are connected by a network of protoplasmic threads and contain large vacuoles next to the nuclei. The rugæ are well developed

Tab. 34.

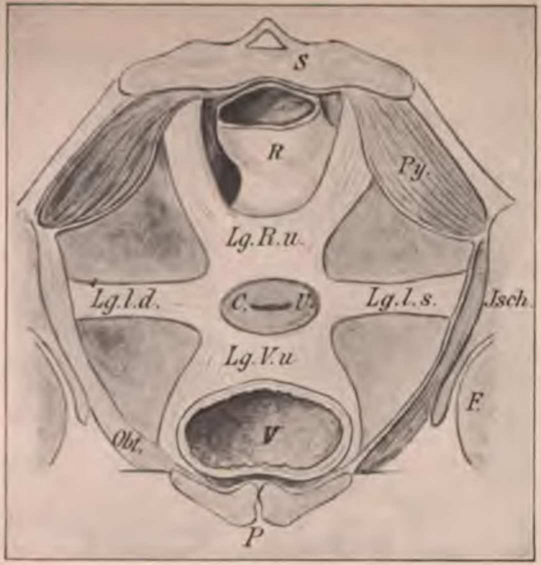

FIG. 75.

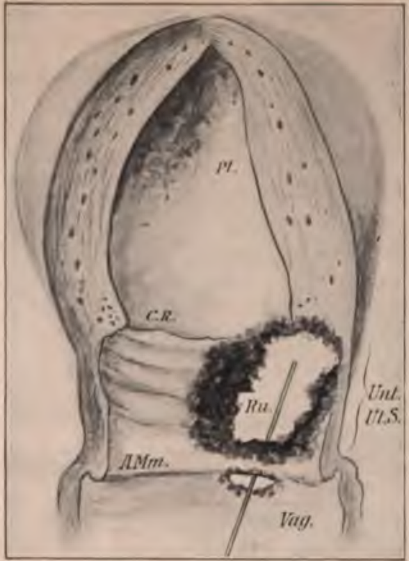

FIG. 76.

in the virgin. Glands, if they exist at all, are represented by a few irregular structures, the *glandulæ aberrantes cervicales et vulvares.* Lymph-follicles, on the other hand, are constantly found in connection with the richly branching lymphatic system. Foci of round-cell infiltration are frequently found and do not necessarily indicate the existence of a local pathological affection.

The muscular coat of the vagina consists of unstriped muscle, is rich in veins, and is not distinctly separable into layers. It contains both circular and longitudinal fibers; the latter pass over the fornix and merge into the longitudinal fibers of the uterus or are reflected into the portio vaginalis. The longitudinal fibers pass obliquely from one side of the wall to the other and merge into the circular fibers. The vagina does not exert an expulsive force, but, like the cervix and lower uterine segment, serves to hold back the presenting part. The submucous layer of connective tissue (or fibrous tissue) is richly supplied with nerves and a venous plexus, and on the anterior and posterior wall forms two conspicuous vertical folds—the *columnæ rugarum.* The two columnæ are not placed exactly opposite each other, the anterior being slightly displaced to the *right*, as a consequence of the anterior displacement of the left Müllerian duct.[1] Upon these columns terminate the transverse folds which constitute the excess of tissue designed for permitting the dilatation necessitated by labor. Behind the urethral orifice is a protrusion—the promontorium vaginæ.

The unstriped muscular coat is supported by pelvic connective tissue and by the muscles that have been described. The posterior fornix or retrocervical fossa is embraced by the fold known as Douglas' pouch (see Figs. 17, 18, 32). The axis of the vagina corresponds with that of the pelvic cavity (from below and in front to above and behind) and presents a curve with its concavity looking forward and downward. The axis of the non-gravid uterus, owing to its anterior inclination, makes with the axis of the vagina an angle of 90 degrees or less; the external os rests on the posterior wall of the vagina.

During pregnancy the papillary layer and, in fact, all the tissues of the mucosa, undergo marked hypertrophy, the secretions are more abundant, and the surface of the canal is roughened and increased both in length and in width.

At the very beginning of gestation a marked turgescence of the vulva is observed, which progressively increases; numerous sinuous phlebectasiæ are seen in the mucous membrane, and the color is dark and livid; the same appearance is noted in the portio vaginalis and in the fornix.

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[1] Like the oviducts, which permanently retain their dual structure, the uterus and vagina are at first double, developing from two Müllerian cell-cords, which later become ducts, and finally fuse to form a single organ. In the columns described we see the physiological remains of this formation, while septa in the uterus or vagina are pathological vestiges of it (uterus bicornis, bicollis, uterus duplex, etc.).

The vulva as a whole takes both an active and a passive part in the mechanism of labor, the one by holding back the presenting part and forcing it toward the pubic arch, the other by the resistance of its slowly yielding, elastic tissues.

A transitional structure is the hymen, or its remains, the carunculæ myrtiformes, which, to judge from its position and embryonal origin, probably belongs partly to the vagina (entoderm) and partly to the vulva (ectoderm).

The urethra ends at the vestibule, which is bounded in front by the clitoris. This consists of an erectile body, terminating in front in a glans and prepuce, and dividing at the posterior extremity into the two diverging crura clitoridis, which also contain erectile tissue and are attached to the ascending rami of the ischium. The organ corresponds to a rudimentary penis; its base is flanked on either side by the cavernous bulbi vestibuli.

The vestibule is bounded below and at the sides by the arched borders of the nymphæ and the frenulum perinæi (fourchette). The surface of the former is covered with numerous papillæ covered with squamous epithelium which follows the inequalities of the surface. The papillæ are wanting in the labia majora. In adults sebaceous follicles are found embedded in both labia, in the fetus they are absent from the labia minora. The stroma of the labia minora is rich in vessels and nerves (tactile corpuscles of Meissner).

The only organs in the vestibule covered with cylindrical epithelium are the glands of Bartholin, whose ducts measure from 1⅕ to 1⅗ in. (3 to 4 cm.) and open about the lower third of the hymen. The perineum ends at the fourchette and consists principally of the muscles described and a thin layer of fat.

The above-described complicated apparatus of soft structures, situated chiefly in the plane of pelvic contraction and at the inferior strait, opposes such a resistance to the advancing head as to cause it to rotate forward and upward (Fig. 48). Propelled by the labor-pains and by the abdominal pressure, the head stretches and compresses the soft parts in a direction from above and in front downward and backward, so that the line joining the fourchette with the lower border of the symphysis makes a right angle with the conjugate of the inferior strait (in a non-pregnant woman the angle is acute). The head, after encountering the resistance of the coccyx, impinges on the posterior portion of the perineum, which becomes greatly distended and elongated. Thus, the lesser fontanel is pushed under the symphysis, while the fibers of the levator ani and transversus perinæi muscles, which are stretched to the utmost and leave the anus gaping wide, retract over the escaping head. The head now performs the *third rotation* about its transverse axis, increasing the distance of the chin from the chest, *and revolves around the symphysis;* the lesser fontanel first appears at the vulva, then the nape of the neck meets the resistance of the symphysis, and finally the sinciput, brow, and face, in the order named, escape over the perineum.

This rotation of the fetal head is brought about by two factors: as the head is subjected to a uniform pressure it encounters the least resistance under the symphysis, and the expulsive force of the abdominal pressure acts upon it less through the yielding vertebral column than by means of a universal internal pressure (reinforced by the pelvic resistance) on the trunk, tending to straighten the fetal body. The fetal spine itself assumes an obstetrical importance when, as in face or brow presentations, it occupies a position in which it offers a greater resistance to the pressure exerted from below and behind, that is, by the sacrum. In the ordinary occipital presentation the head remains freely movable as the pressure through the vertebral column pushes it toward the sacrococcygeal curve, so that a slight flexion suffices to allow it to advance. In face presentations, on the other hand, the vertebral column is already extended when the head reaches the sacrococcygeal curve, that is, the head is flexed as much as it can be; if then, the chin is anterior, *i. e.*, opposed to the symphysis, rotation about the symphysis may take place by a sinking of the chin, and the brow escapes over the perineum, followed by the occiput. But if the chin is posterior and becomes arrested in the sacral curve, flexion of the head becomes impossible on account of the overextension of the vertebral column, and labor comes to a standstill.

We have, therefore, to distinguish three different *kinds of rotation* in the birth of the head in vertex presentations:

1. Flexion of the head about the transverse diameter, bringing the chin nearer the breast, or *descent of the lesser fontanel*, to enable the head to engage in the superior strait—the result of "pressure on the fetal spine" and extension of the trunk.
2. Rotation about the vertical diameter, *anterior rotation of the lesser fontanel*—the result of the gradual increase of the anteroposterior diameter as the outlet is approached.
3. Extension of the head about the transverse axis, arrest of the occiput by the symphysis, *rotation of the occiput around the symphysis*, the effect of the resistance offered by the pelvic floor.

The next step comprises the arrest of the neck and anterior shoulder (the right in the first vertex presentation, L. O. A.) by the symphysis, and the birth of the anterior shoulder under the symphysis, followed by the escape of the posterior shoulder over the perineum. The face then turns toward the mother's thigh (the right in the first vertex presentation, L. O. A.).

Similar movements of rotation are performed in all other straight presentations by the presenting part of the fetus.

For further details and for the management of labor the reader is referred to the *Atlas of Labor and Operative Obstetrics.*

CHAPTER IV.

THE PUERPERIUM AND THE TREATMENT OF THE NEW-BORN INFANT.

§ 8. PHYSIOLOGY OF THE PUERPERIUM.

THE puerperium embraces the period of retrograde changes in the sexual and other organs affected during pregnancy (§ 2, table). Practically its duration is measured by that of the most conspicuous symptom—the lochial discharge. The lochia represent the wound-secretion of the lacerated inner surface of the uterus, deprived of its epithelium and of part of the submucous connective tissue by the separation of the placenta and the greater part of the decidua.

The separation and expulsion of the placenta usually take place within half an hour after the birth of the child; the process consists essentially in the separation of the fetal membranes from the uterine wall. We have seen (§ 1) that the cell-cords of the maternal decidua and the fetal chorionic villi are closely interwoven; hence, to effect a clean separation, all the projecting processes of one or the other tissue must come away bodily with the bulk of the other tissue. As it is the network of chorionic villi that separate, the latter carry with them all the processes of decidual tissue that dip in between the villi. The maternal surface of the placenta is accordingly fairly smooth, although subdivided by rather coarse furrows into a number of larger cuboidal aggregations of chorionic villi, known as *cotyledons* (Figs. 20, 23, 25).

The mechanism of the expulsion of the afterbirth is usually as follows: first, one placental border, or a part near the border and the central portion of the placenta, or, rarely, the center alone is separated from the uterine wall by the muscular contraction (*Atlas of Labor and Operative Obstetrics*, Figs. 15 and 16). The space thus formed becomes filled with blood from the torn maternal vessels and the retroplacental hematoma results, containing on the average 7 fl. oz. (225 gm.) of blood. The loosened marginal portion is then forced into the internal os, the remainder of the periphery still adhering (Fig. 27), whereupon, in most cases, the entire fetal surface with the umbilical cord is extruded into the vagina and is, accordingly, the first portion to appear at the vulva. This, which is known as Schultze's mode of separation, does not, therefore, refer to the initial separation of the placenta (Fig. 26). The expulsion of the placenta is rarely effected throughout according to Duncan's mode, in which the marginal portion, which is the first to separate, is also the first to be extruded; if it does so happen, the membranes are not separated from the fetal surface.

After the placenta has been extruded from the uterine cavity it may remain indefinitely in the vagina until it is finally expelled by the abdominal pressure, by the patient's being cautiously raised to a sitting posture, or by Credé's method (*Atlas of Labor and Operative Obstetrics*, Fig. 18). If the latter fails to effect its delivery it is probably held fast by a spasmodic stricture of the internal os or, more rarely, of the constrictor vaginæ, or, in very rare cases, by inflammatory adhesions. If the uterine contractions are too weak to effect the separation the condition is usually accompanied by hemorrhage due to atony of the uterine muscle.

When the uterine cavity is completely evacuated the womb contracts firmly and resumes its somewhat flattened shape; the longitudinal muscle-bundles can be felt along the posterior wall. The organ is not spherical, the posterior wall is flattened; it lies in anteflexion and the fundus reaches to about the level of the navel. It is only when the uterus is relaxed that it falls backward in retroversion and is covered by coils of intestine, or is distended into a globular form by the inpouring blood. These post-partum hemorrhages from atony of the uterine muscle are exceedingly dangerous, especially as the woman in such cases is usually in a debilitated condition.

The arrangement of the muscle-fibers described in § 5 is such that in contracting they constrict the traversing blood-vessels, and effectually stop the flow of blood until such time as the gaping mouths of the vessels at the placental site are occluded by firm thrombi. The lumen of the uterus is very narrow and is completely filled by the folds of mucous membrane, the thrombosed vessels of the placental site, and the lochial secretion. The cervical canal is reduced to a loose, flabby sac into which the thickened folds of the uterine wall protrude. It is most important to be able to recognize this condition with the palpating finger in intra-uterine manipulations during the third stage of labor.

In regard to the anatomy of the retrograde changes which take place in the uterus during the puerperal period more will be said later on; for clinical purposes it is important to remember that, if involution is normal, the fundus ought to be found behind the symphysis on the ninth day, and on the fourth day nearly at the level of the umbilicus.

The weight of the uterus on the eighth day after parturition is 13 to 19 oz. (400 to 600 gm.); on the fourteenth day, 10 to 17 oz. (300 to 500 gm.); after five weeks, 7 oz. (200 gm.); after eight weeks, 2 to 2½ oz. (50 to 75 gm.). The greatest diminution observable in the living subject takes place from the ninth to the twelfth day, when the length decreases by 1 in. (2.5 cm.), the breadth by ⅘ in. (2 cm.), for each day; the length, therefore, diminishes more rapidly than does the breadth. The retrograde process is one of fatty degeneration, the result of overgrowth of connective tissue in the media. The albumin of the muscle-cells is converted into peptone (discharged in urine and lochia; myometra). The blood-vessels at the placental site in part become occluded by thrombi, in part compressed by the contracting muscle-fibers. Pigment is found at this site four to six weeks after parturition. The formation of new muscle-fibers begins early. In normal cases the decidua separates only in part. A new epithelial covering is formed from the epithelium of the glands. The occurrence of involution is explained by the diminished blood supply on account of the contraction of the organ, and, in part, is due to the influence of the nerve-centers.

Two causes are active during the involution of the uterus: the permanent contraction of the organ, and fatty degeneration of the individual muscle-fibers. Both processes are under the control of nerve-centers, hence any undue mental excitement must be carefully guarded against, as it might cause severe postpartum hemorrhage, or arrest the flow of milk, or at least produce chemical changes in this secretion. In this connection I recall a case in which I was summoned on the fourth day and

FIG. 77. **Distribution of the Venous Plexuses of the Pregnant Uterus** and their relation to the arteries (modified from Heitzmann's injected specimen): *T*, tube with fimbriated extremity; *Lg.l*, broad ligament; *Ut*, uterus; *P*, portio vaginalis; *V*, vagina.

FIG. 78. **Distribution of the Lymphatics of the Female Genitalia** (after Poirier): *Ut*, uterus; *Ov*, ovarium; *T*, tube; *Lg.r*, round ligament; *Lg.l*, broad ligament; *P*, portio vaginalis; *V*, vagina.

FIG. 79. **Secreting Cells of Mammary Gland:** 1, fatty cylindrical cells; 2, spindle-cells in connective tissue; 3, blood-vessel; 4, duct. In the lumen of 1 are seen fat-granules extruded by the cylindrical cells (original drawing).

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found such an apparently unaccountable hemorrhage, the cause of which proved to be a dispute about the christening of the infant, the mother-in-law, who was of a different religion, wishing to secure it for her own faith. In another case the cause of the hemorrhage was the burning of the child's crib. The connections between the genital ganglia and the central nervous system are numerous (see § 5, *ad finem*).

The fatty change in the muscle-cells can be demonstrated with the microscope; the cells become filled with fatty granules during the puerperium, later the granules disappear and the muscle-fibers are much reduced in size. The process is associated with lessened blood-supply and histological changes in the vessels: diminution of the lumen by overgrowth of the connective tissue in the intima and fatty degeneration of the media. Macroscopically the adnexa, especially the venous plexuses and lymph-channels of the broad ligaments, are seen to be overfilled until the end of the first week of the puerperium. The lymph-channels perhaps participate along with the lochia in the removal of the products of degeneration in the muscle-fibers. The slowing of the pulse, which is physiological, is to be attributed to the presence of fat in the blood, while the other product, peptone, has been found in the urine. Both diminished pulse-rate and peptonuria, however, sometimes occur independently of involution.

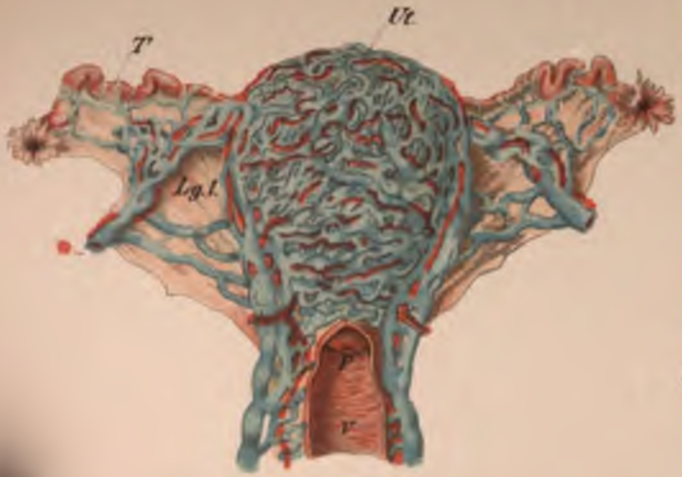


Fig. 77.

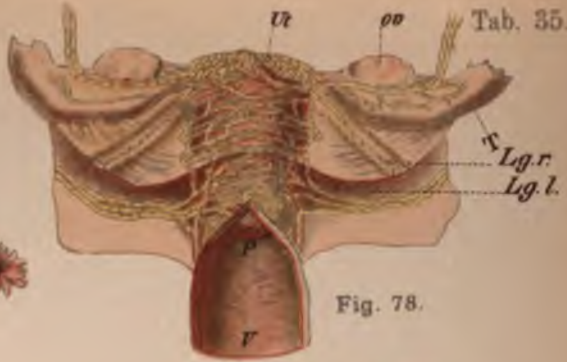
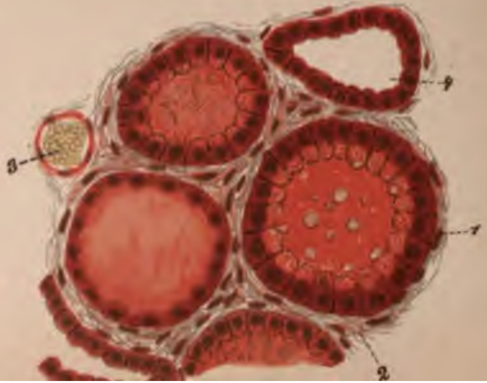


Fig. 78.



The *veins* form plexuses which, in the main, follow the branches of the uterine arteries and empty into the internal iliac vein. The pampiniform (or spermatic) plexus lies in close relation with the tube and joins the internal ovarian vein, consisting of two branches which, after uniting, empty into the renal vein on the left side, and directly into the inferior cava on the right. If there is loss of vasomotor tone or venous stasis the veins in the broad ligaments form a varicocele.

The *lymphatics* originate partly near the uterine glands and partly in the subperitoneal connective tissue, traverse the broad ligament, and terminate within the internal iliac and inferior inguinal glands of the pelvis and in the inguinal glands.

If the uterine cavity is invaded by pathogenic germs, these two channels furnish the paths by which either the toxins or the bacteria themselves are carried to other parts of the body. Either the thrombi which form in the placental vessels become infected and undergo decomposition as far as the junction of these vessels with the vena cava and renal vein, where septic emboli are detached, enter the systemic circulation and become arrested in the pulmonary system, or the germs make their way through the uterine walls along the lymph-channels and, through the agency of the subserous, ovarian, intraligamentary, and other vessels, infect the surrounding connective tissue and the peritoneum, giving rise to *para-* and *perimetritis.*

These different forms of infection are all included in the general term "puerperal fever."

The organism itself possesses efficient means of defence to protect itself against the invasion of such pathogenic germs, and an active offensive armor to render them harmless after they have gained access to the body.

The former is found in the anatomical and physical arrangement of the vulva, vagina, and cervix, and in the chemical properties of the secretion of the vagina and cervix; the latter includes *alexins* (antitoxins), or bactericidal substances in the blood-serum, and the germicidal properties of the leukocytes and of the epithelial and other cells.

The obstetrician should not only guard against the entrance of bacteria into the genital tract, above all, the uterine cavity, with the greatest care, but should also take the proper precautions to preserve the efficiency of the alexins (antitoxins) in the blood and in the genital secretions. The integrity of the former is preserved by keeping up the general health of the patient, by preventing the occurrence of hemorrhage or fever, and by avoiding unduly protracted labor in cases of contracted pelvis, and by removing as speedily as possible any disease that may be present during pregnancy, especially nephritis, failing compensation in valvular lesions, or continued dyspepsia.

To guard against deterioration of the genital secretions it is necessary to remove any inflammation of the mucous membrane, especially endometritis, before the onset of labor. Strong antiseptic or caustic solutions should never be used *sub partu* to irrigate the vagina; in making genital examinations care must be had to avoid wounding the tissues around the internal os; the membranes must not be ruptured too soon—in fact, every means must be employed to facilitate the descent of the presenting part as much as possible, and to obviate any cause for avoidable disturbances of the circulation in the genitalia, such as allowing the head to become wedged against the lateral walls of the pelvis, insufficient or tardy rotation, and unskilful handling of the forceps in breech presentations.

The genital secretion is found in the tube, in the uterine cavity, in the cervical canal, and in the vagina; the greater part of it is produced in the three first-named structures, that found in the vagina mostly originating in the cervix. The amount of secretion present in a healthy virgin in all these parts is exceedingly small: merely a little mucus in the tubes and in the uterus; and in the vagina a small quantity of dry, granular detritus of cast-off vaginal epithelium, which becomes slightly more milky shortly before and after menstruation. Even in healthy married women but little secretion is found except during periods of congestion, such as menstruation and pregnancy. The vaginal detritus is mixed with small quantities of mucus from the cervix; the cervix itself is occupied by a plug of glairy mucus, which, according to Kristeller, assists in fertilizing the ovum, as it is forced into the vault of the vagina when the orgasm is at its height, and after being loaded with spermatozoa is drawn back into the cervix by virtue of its viscidity.

Examinations of mucus from healthy tubes and from the uterine cavity show that it is sterile, *i. e.*, free from pathogenic germs. The same is true, in most cases, of the upper two-thirds of the cervical canal, which is closed by a plug of tough, glairy mucus, preventing the entrance of bacteria (Ahlfeld) and covered near the external os by a layer containing leukocytes. The latter are undoubtedly, as Walthard has pointed out, placed there to stand guard at the entrance of the uterine cavity, since immediately below them, in the external os, a narrow zone containing large numbers of bacteria can be demonstrated. The vagina soon after birth becomes the abiding-place of numerous germs, which grow more and more plentiful as the introitus is approached. Some of these germs are pathogenic, although in healthy individuals with normal genitalia their virulence is very slight (Walthard, Ahlfeld, Vahle, Kottmann). Still, they are unquestionably there, and any complication during labor may alter the conditions of their surroundings so as to increase their virulence and lead to the infection of the uterine cavity (thrombosis of the uteroplacental vessels) or of any other solution of continuity in the mucosa of the genital tract; in other words, may set up puerperal fever. Such altered conditions include, for instance, lacerations and the presence of putrescible organic matter (dead fetus, contused tissues). Another favorable medium for the growth of bacteria is furnished by the gonococcus, which in itself is also capable of producing puerperal febrile conditions. But by far the most frequent and, from a practical standpoint, the only source of infection worth considering is lack of cleanliness in digital explorations. The dangers from this source increase in direct proportion to the duration of labor, the presence of complications, and the favorable

FIG. 80. **Mammary Gland of a Blonde Primigravida, in the Seventh Month** (original water-color).—Striæ; turgescence of the nipple and of the entire breast, which does not hang down; moderate pigmentation of areola; so-called "milk-veins" seen through the integument.

FIG. 81. **Necrotic Decidua** (see § 12).

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condition of the soil for pathogenic germs. All the bacteria which have their habitat about the external genitalia have been found within the vagina; they include the Streptococcus pyogenes (a non-pathogenic streptococcus is also found), Staphylococcus albus and aureus, Bacterium coli commune, occasionally Fränkel's pneumococcus, which is found even in pyosalpinx, and Löffler's diphtheria bacillus (another non-specific bacillus resembling the latter has also been found). In addition to these there is present as a constant inhabitant Döderlein's bacillus, the thick, rod-shaped organism to which the bactericidal acid reaction of the vaginal mucus is attributed, though it is not always bactericidal, and, finally, large numbers of so-called anaërobic saprophytes, which cause the putrefaction of retained shreds of ovum. It is important to remember that the bactericidal power of the genital secretions is much diminished or even destroyed during the first days of the puerperium, owing to their conversion into the alkaline lochial discharges. During labor, on the other hand, their bactericidal power is greatly reinforced by the presence of the amniotic fluid, which possesses the same property in a marked degree. Experiments with this fluid have shown that so-called anaërobic saprophytes cannot live in it at all, and even the pathogenic varieties lose their virulence.

Krönig, with other authors, denies the presence of pathogenic germs (streptococci) in the healthy vaginal secretion of a pregnant woman.

The *lochia* are divided into three physiological forms: lochia *cruenta* (rubra), consisting of blood only; lochia *serosa*, consisting of serum with numerous leukocytes, nucleated decidual cells, epithelial cells, and cocci; and lochia *alba*, serum with but few cells and cocci:

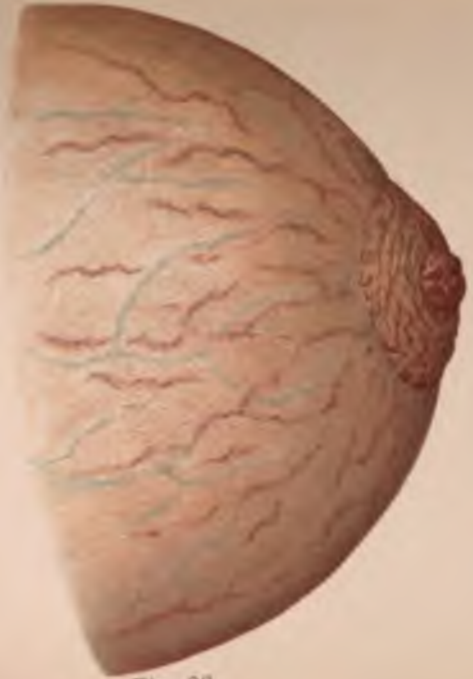

Fig 80.

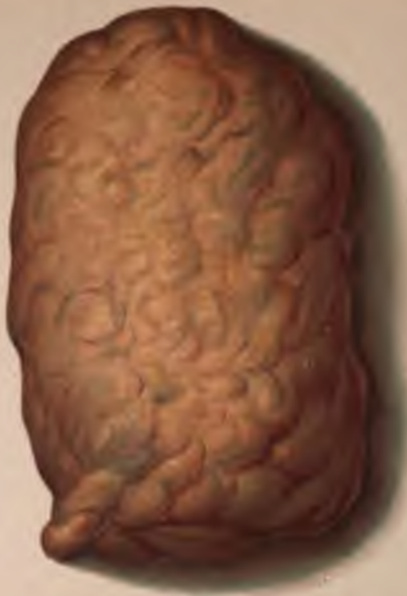

Fig. 81.

Lith. Anst F. Reichhold, München.

Days.	*Mother.*	*Child.*
1st to 2d.	*Lochia cruenta* or *rubra*. Fundus almost at the umbilicus; afterpains. Liquid diet.	Line of demarcation appears on the navel. Greatest diminution in weight.
2d to 3d.	*Lochia cruenta*, congestion of breast. Lateral decubitus permissible.	Separation of cord; meconium has disappeared.
3d to 5th.	*Lochia serosa*, temperature: 98.6° to 100.4° F. (37° to 38° C.) maximum.	
7th to 8th.	*Lochia alba*, colostrum has disappeared; placental site can still be felt.	Physiological jaundice.
9th.	Fundus behind the symphysis.	Temperature: 98.4° to 100° F. (36.8° to 37.7° C.). Weight same as at birth.
10th.	Patient may be allowed to get up.	Average daily gain, 20 to 35 grammes.

There is a physiological connection between the lochial discharge and the secretion of milk, the latter beginning on the second to the fourth day, when the former undergoes a change. Conversely, an excessive lochial discharge influences the amount of milk secretion unfavorably. Massage of the abdominal walls and viscera has a favorable effect on both the lochial discharge and the secretion of milk.

The involution of the muscularis has been mentioned in § 5. The *regeneration of the mucous membrane* is marked by the gradual destruction of the decidual cells and the growth of a stroma rich in round cells, in which and from which the new glands are formed. The regeneration of the latter is accomplished by proliferation of the intact cylindrical cells in the fundi of the glands. These cells also produce the single layer of cylindrical cells which clothes the surface of the newly formed mucous membrane (see Fig. 87).

The involution of the other organs of the body was referred to in § 2. For clinical purposes it is to be remembered that the pulse of a puerperal patient is often exceedingly slow and soft, hence the presence of even a moderately accelerated pulse should excite suspicion, though a certain degree of irregularity is physiological in

FIG. 82. **Lochia Rubra or Cruenta**: 1, decidual cells; 2, squamous epithelium; 3, red blood-corpuscles in rouleaux; 4, isolated red blood-corpuscles; 5, leukocytes; 6, isolated cocci (diplo-).

FIG. 83. **Lochia Serosa or Sanguinolenta** (numbers the same as in the preceding figure).—The cells are granular.

FIG. 84. **Lochia Alba**: 6, masses of cocci; 7, granular, vesicular spindle-cells; 8, cholesterin plates.

FIGS. 82–84.—Drawings from original preparations.

FIG 85. **Colostrum-cells.**—Fat-droplets (1) extruded (3) from the fatty cells (4) (cf. Fig. 79); 2, leukocytes.

FIG. 86. **Milk.**—The fat-droplets (1) are suspended in water; two leukocytes are seen (2).

FIGS. 85 and 86.—Drawings from original preparations.

FIG. 87. **Section through the Wall of a Puerperal Uterus** (microscopical; original): 1 and 2, circular muscle-fibers, some of them in a state of granular degeneration; 4, loose-meshed, edematous connective tissue; 3, large muscle-fibers in cross-section; 5, a large, thick-walled vessel with red thrombus and beginning fibrin formation ("ribbed"); 6, a vessel in which the thrombus has become completely organized, showing lamella formation; 9, large capillary vessels of the subdecidual mucosa already converted into connective tissue; 7, irregularly contracted muscle-fibers in process of degeneration, the cells have failed to take the stain; 8, large capillary vessels newly formed during pregnancy; 10, glands which have retained their cylindrical epithelium in the depth during pregnancy; these cells subsequently proliferate and furnish a covering for the regenerating mucous membrane; 11, stroma of the mucous membrane containing numerous decidual cells (12, 13); in one of the capillary spaces filled with decidual cells is seen a chorionic villus (14).

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the beginning of the puerperal period. Individual idiosyncrasy plays a much more important rôle in this slowing of the pulse-rate than the earlier authors were disposed to admit (Heil).

As the lochial discharges diminish, the changes in the mammary gland culminate in the establishment of its true function, the copious secretion of milk (on the third day).

As early as the second month, as has been mentioned in § 2, it is often possible to express serum from the nipple. The first indications of the changes brought about by pregnancy are observed during the first month in the form of tugging and stabbing pains, a feeling of increased weight and distention, tenderness on pressure,

Tab. 37.

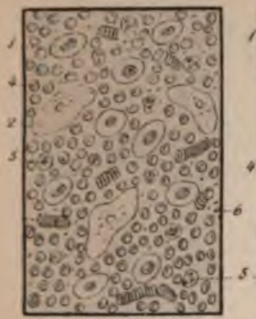

Fig. 82.

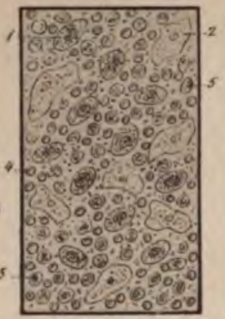

Fig. 83.

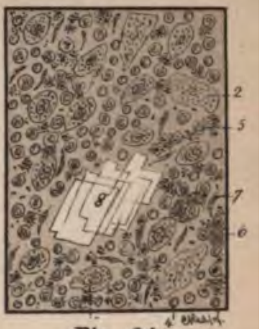

Fig. 84.

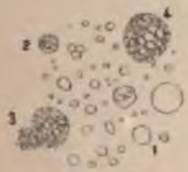

Fig. 85.

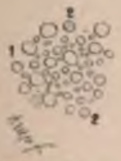

Fig. 86.

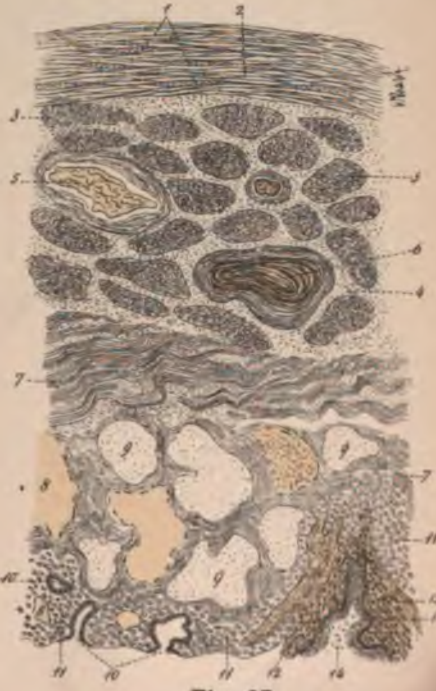

Fig. 87.

Lith. Anst. F. Reichhold

and the presence of radiating cords recognized by the sense of touch. The fifth month is characterized by the appearance of striæ, pigmentation of the areola, the formation of a secondary areola, and by prominence of the Malpighian glands. The epithelium of the acini proliferates and forms new glandular structures, while the interlobular connective tissue swells and becomes looser; fat begins to form in the interstices between the fifteen to twenty-four cake-like lobes of each gland, the ultimate lobules of which correspond to the above-mentioned glandular acini. The ducts of the individual lobes unite at the nipple and together form the *lactiferous sinus.*

The cells of the glandular epithelium are polyhedral, somewhat flattened, and granular; they are separated from the lymph-channels by a small amount of connective tissue, which corresponds to the tunica propria, and a layer of endothelial cells outside of the latter.

During pregnancy the cells become taller, more cuboidal, multinuclear, and contain more albumin; fat-droplets collect in their free border near the lumen of the acinus, and are discharged along with the peripheral portion of the cell (Fig. 79).

We find such alveolar cells filled with fat-granules in the colostrum, where they constitute the *colostrum-corpuscles* (Fig. 85). They are found in the milk until the fifth day of the puerperium, and by their rupture the suspension of the fat-droplets in the milk-serum is accomplished; the process begins in the milk of the third and fourth days (Fig. 86). The delicate so-called "haptogenic membrane" of the milk-globules has no actual existence. *Milk is a simple emulsion of fat-droplets.* Leukocytes, isolated pale cells, and fission-fungi (staphylococci) are also found in milk.

COMPOSITION OF HUMAN MILK:

New. (Fifth day after delivery.)		*Old.* (Five months after delivery.)
1.52	0.9	3.92 casein.
3.28	3.3	3.66 fat.
5.38	6.8	4.36 sugar of milk.
0.30	0.2	0.14 salts.
	2.—5	0.38 albumin.
		0.13-0.33 peptone.

In addition the milk contains urea, lecithin, and cholesterin. Daily quantity 1 to 3 pints (500 to 1500 c.c.); specific gravity 1026 to 1036.

Colostrum contains principally albumin, which is converted into casein in the milk and is coagulated as such by boiling or precipitated by rennet: it also contains salts—magnesia, calcium phosphate, common salt, and chlorine—which act as laxatives to assist in the evacuation of meconium.

§ 9. PHYSIOLOGY AND FEEDING OF THE NEW-BORN INFANT.

The natural and only "ideal" food for the nursling is its mother's milk, providing the mother be well and strong, and neither markedly neurasthenic nor hysterical. It is better than the milk of a wetnurse for several reasons: in the first place, the time of delivery is rarely the same in the wetnurse as in the mother, and the chemical concentration of the milk is thereby materially affected; in the second place, one can never be sure of the constitution, past history, and general character of the wetnurse; and, in the third place, it cannot be doubted, although the question is not susceptible of proof, that the milk of its own mother, providing she be healthy, is always the one best adapted to the infant's needs. Children brought up on their own mother's milk not only appear to thrive better, but show a greater power of resistance, both during infancy and in later life. In other words, they acquire a more vigorous constitution.

The best criterion of an infant's well-being is its general habit and, above all, its body weight. The new-born infant for some time after birth must be regarded as a relatively immature creature, especially as compared with the young of most mammals. Its volitional acts during the first weeks of life are exclusively limited to the regulation and performance of vegetative functions. Thus the separate organs of the body, as they gradually approach a state of independence, acquire the necessary tone and power of resistance to enable them to withstand deleterious influences from without. Hence the index of the infant's growth is found not only in the increase of the body weight itself in proportion to its growth and its increase in size, but particularly in the increased density of the individual organs by the deposition of the essential tissue-elements on which their functions depend. Since, however, all the "vegetative" organs, with the exception of the lungs, are active during the last months of fetal life (heart and vascular system, liver and bile secretion, renal and even gastric and intestinal secretion; the fetus even performs the act of deglutition, as shown by the lanugo hairs which find their way into the intestine along with the amniotic fluid), they are found to have reached a certain stage of development in the new-born, so that the important process of nutrition and digestion can begin at once.

The brain at birth possesses relatively the lowest specific gravity of any of the organs.

As regards the morphology, the formation of the first fissures is not observed until the seventh or eighth fetal month; at birth the convolutions are already fairly well developed. The tissue-elements, however, and the chemical composition are in a very undeveloped state. Although the brain appears to keep pace with the other organs and with the entire body in regard to bulk after the fourth fetal month, its weight is relatively much lower, the specific gravity being even less than that of the blood, hence the brain of a new-born infant contains a greater percentage of water than does its blood. This condition, however, undergoes a rapid change during the first year of life, the specific gravity of the brain increasing as the psychical functions are awakened.

Like the cerebral functions, volitional movement of the muscles of the limbs and trunk remain in abeyance during intra-uterine life. The so-called "fetal movements," which are felt after the fourth fetal month, both by the mother and by the hand of the examiner, represent merely reflex movements and are in no sense purposeful. Although they appear to be quite forcible, the amount of muscular exertion is really very slight, as the amniotic fluid in which the child is suspended is quite high in specific gravity and, therefore, permits the trunk and limbs to be moved with very little exertion.

The histological changes which occur in the first days of life, as muscular activity begins to be established, are such as we should expect to find. The muscles of the fetus and of the new-born infant are pale in color and very quickly become fatigued after electrical stimulation. In other words, they go into fatigue-cramp, and this probably explains why the new-born infant is so subject to convulsions; if we make a tracing of the muscular contractions in new-born infants, we find that the curves resemble those of fatigued muscles in an adult. Under the microscope these pale muscles present only transverse striations; whereas, the muscles of children five to eight days old are not only of a deeper red color but also show both longitudinal and transverse striations very plainly.

The rapidity with which calcium salts are deposited in the skeleton may be judged by the speedy hardening of the bones of the skull, which at birth are still quite compressible, and by the rapid closure of the sutures and fontanels, in spite of the active growth of the brain and calvarium. If the food contains an insufficient amount of calcium salts, rachitic softening of the bones results, or at least the closing of the fontanels is delayed beyond the first year, giving rise to parchment-like crepitation of the flexible and movable cranial bones.

This consolidation of the tissues is the sole occupation of the new-born infant during the first weeks of its life.

The establishment of the sense of sight is the first sign, as it is the principal factor in the awakening of the psychical life. The time of its appearance is subject to variation, depending on individual development and particularly on the general bodily health. Thus the baby will begin to stare at a conspicuous object in its second month, although reaction to a bright light is established very soon after birth, and there is an evident appreciation of loud sounds and of the taste of very irritating substances, such as quinine. During the third and fourth months the infant begins to appreciate finer differences by the sense of sight, and in the sixth month by the sense of hearing. The tactile sense is strongly developed from the beginning, especially about the mouth.

In debilitated, sickly, or insufficiently nourished children, the awakening of conscious sensations, of perceptions by the special senses, of conscious imagination, and, finally, of conscious memory, is delayed until a later period.

At the moment of birth a profound revolution takes place in all the organs. Whereas, up to this period, the purification of the infant's blood, the process of supplying it with matured products of metabolism, and the function of respiration (reception of oxygen, as well as elimination of carbon dioxide) is performed exclusively by the mother, and even the infantile circulation is materially assisted by the uterine tonus which reacts on the vessels of the chorionic villi—from the moment of birth the childish organism is thrown entirely on its own resources. Not only is the heart called upon to do its work alone, but this work is materially increased by the fact that, as pulmonary respiration begins, the entire mass of blood has to be forced through the intricate system of pulmonary capillaries, where the altered blood-current encounters a new and considerable resistance.

At each inspiration (which at first is of little importance in respect to respiration) the lungs take up large quantities of blood into the capillaries of the pulmonary arteries, which now contain blood from the right ventricle instead of carrying it directly to the aorta through the ductus arteriosus. The ductus arteriosus is therefore superfluous and becomes obliterated about the end of the third month. The pulmonary veins convey the first oxygenated blood back into the left auricle of the heart; this produces a rise in pressure which prevents the entrance of mixed blood from the right auricle; all the blood goes into the right chamber and from there into the pulmonary arteries, and the lesser circulation is established, closure of the valve of the foramen ovale begins and is completed in from sixty to eighty days. The fetal circulation has become converted into the infantile circulation.

As has been mentioned, the digestive organs of the new-born infant secrete small quantities of ferments capable of decomposing both starch and albumin; hence, we have a scientific proof of the possibility of digesting starches, which is an important point in artificial feeding. Human milk is so accurately adapted to the needs and to the chemical powers of assimilation of the stomach and intestine that only very healthy human infants can digest unprepared cows' milk. Cows' milk contains much more casein than does human milk; the amount of pepsin contained in the human stomach is not sufficient to digest this casein and render it fluid, hence the casein does not get beyond the stage of coagulation in the acid gastric secretion, and passes into the intestinal canal in the form of curds, which are frequently vomited. These solid particles irritate the mucous membrane and form a favorable medium for the development of any pathogenic micro-organisms that may have entered with the food.

Asses' milk or goats' milk is best adapted to the human infant, but it is difficult to obtain.

But although the milk of animals may be harmful, it may be preferable to the mother's milk if the quality of the latter has deteriorated by reason of the mother's ill health or a sudden nervous disturbance, such as fright, anger, or convulsions. Under these conditions the milk may make the child vomit or set up a diarrhea, with attacks of colic or even general convulsions.

It is, of course, evident that the infant must possess some natural means of protection against such accidents; they are, however, subject to great individual variations. They depend on the inherited fetal energy, the congenital power of resistance, in short, that which is known as "constitution." The simplest and most reliable means of determining this resisting-power consists in weighing the child regularly every week. The factors which determine the body weight and power of resistance of the infant during the first months of life are somewhat complex.

It has been said that the period at which the special senses first make themselves manifest in infants depends on the individual progress in the development of the entire body, which again is influenced by the inherited constitution and the care and feeding of the infant, and that the first weeks of life are entirely devoted to building up the resisting power of the whole organism, so as to enable it to withstand the transition from fetal to independent metabolism. The body weight is not only an index of the infant's growth and general development, but it also furnishes us with the means of determining any arrest of development due to some obscure lesion, the cause of which may not necessarily reside in the child or in its food or even in the constitution of the parents, but may be a temporary injury to the mother during pregnancy or at the time of conception, such as illness, mental trouble, alcoholic abuse. Thus the latent stage of a disease may be revealed by a sudden fall in the body weight before any symptoms become manifest.

If we take a series of healthy children born of healthy parents and examine the changes in weight, from the first days of life, we find that the body weight undergoes typical variations, and if we represent these variations by a curve we find a marked decline immediately after birth, the lowest point being reached on the third day of the infant's life. From this point the curve gradually rises; but, according to my investigations, not more than 14 per cent. of all the children regain their original weight by the end of the first week; many do not reach this point before the seventh or even the tenth day, while in 44 per cent. the weight at the end of the second week is still lower than it was at birth.

The cause of this loss of weight is to be sought in the metabolic processes. I compared the absolute weight of the ingested milk with the total amount of intestinal and renal excretion, to which I added the liquid and gaseous and metabolic products excreted through the skin and lungs, with the following result:[1]

From the first to the third day (inclusive):
10 oz. (+ 300 gm.) ingested milk.
15 oz. (− 453 gm.) excreted products of metabolism.
5 oz. (− 153 gm.).

Five ounces (153 gm.), therefore, represents the apparent loss in body weight. As a matter of fact, however, the average loss during these three days amounts to 11 oz. (337.6 gm.), which leaves 6 oz. (184.6 gm.) of tissue consumption to be accounted for.

For the period from the fourth to the seventh day (inclusive) I obtained the following figures:
Total amount ingested, 50 oz. (+ 1539 gm.) milk.
Total amount excreted, 32⅔ oz. (− 1013 gm.) metabolic products.
Apparent increase in body weight, 17⅓ oz. (+ 526 gm.).
Actual average increase in weight, 7 oz. (+ 210 gm.).

Again the increase in weight is less than would be expected from the calculation, and there remain 10 oz. (316 gm.) of tissue consumption to be accounted for.

In accordance with the relatively low functional activity, the fetus generates, as we have seen, only a slight amount of heat of its own. As soon as the fetus is born it loses a large proportion of this heat by radiation, but this loss is made good by the establishment of many new functions which, by the chemical and physical processes to which they give rise, generate a considerable amount of warmth and of gases—the chief factors in this heat production being the pulmonary and cutaneous respiration, the digestive processes, and chemical cell-activity. Hence the excess of ingested milk, as seen above, is used for this heat production and not for the purpose of building up the body by increasing the body weight.

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[1] Reported at length in *Arch. f. Gyn.*, 1897.

The disproportion between the amount of nutriment supplied in the milk and the loss in weight, or the unexpectedly low increase in weight during the first eight or fourteen days, is therefore explained by this consideration of the heat-producing power of the milk and of cutaneous radiation; in other words, by the heat production.

As during the first three days the amount of milk ingested is not sufficient to maintain the necessary degree of heat, and as the rapidity with which the organs in general accustom themselves to the performance of their new functions is subject to individual variations, the body during this time consumes its reserve supply of material derived from the mother. Thus I found that the weight-curve corresponded with the temperature-curve and with the curve representing the total amount of nitrogen excreted in the urine. This phenomenon undoubtedly explains the so-called physiological icterus which is so often seen in infants in the first week, and which is probably due to the destruction of large numbers of red corpuscles (Hofmeier).

The body temperature is extremely variable during the first few days, as heat production and heat radiation have not yet become properly regulated.

The temperature of the skin in the infant is 77° to 84.2° F. (25° to 29° C.) as against 89.6° to 93.2° F. (32° to 34° C.) in the adult, because the radiation in the former is so much more active. Thus, I found the temperature on the epigastrium in an infant which had been clothed as usual on the average 97° F. (36.1° C.) during the first week (in boys slightly higher than in girls), while in adults it is only 95° F. (35° C.). This shows how important it is to guard the infant against any loss of heat while Schultze's method or other similar manipulations are performed for the pur-

Table Showing Physiological Variations in Weight of Child and the Number and Amount of Feedings.

	Total average quantity in twenty-four hours.	Proportion of milk to water.	Contents of Soxhlet bottle.	Amount of each feeding.	Number of feedings.	Duration of one feeding.	Weight of child.		Average daily increase.	
							Breast-fed.	Soxhlet.	Breast-fed.	Soxhlet.
1st to 3d day.	10–180 gm.	1 : 3	. . .	5–40 gm.	2–5	10 min.	from 3300	from 3300	in all —200 gm.	in all —200 gm.
4th to 7th "	200–500 "	1 : 2	80 gm.	40–80 gm.	from 5 to 1 every 3 hours.	15 "	to 3100	to 3100		
8th to 14th "	500–650 "	1 : 1	7 × 80 gm.	85–90 gm.	7–8	20 "	3320	3320	+ 5 gm.	+ 5 gm.
1st month.	700–800 "	1 : 1		100 gm.	7–8	. .	3740	3665	+ 30 gm.	+ 23 gm.
2d "	800–850 "	1 : 1	6 × 150 gm.	100–110 gm.	7–8	. .	4590	4235	+ 28 gm.	+ 19 gm.
3d "	800–900 "	2 : 1		100–150 gm.	7	. .	5370	4835	+ 26 gm.	+ 20 gm.
4th "	800–950 "	2 : 1	6 × 200 gm.	110–150 gm.	6	. .	6090	5365	+ 24 gm.	+ 19 gm.
5th "	800–1000 "	3 : 1		150–170 gm.	5–6	. .	6690	5965	+ 20 gm.	+ 20 gm.
6th "	900–1100 "	3 : 1		up to 200 gm.	5–6	. .	7200	6475	+ 17 gm.	+ 17 gm.

pose of establishing respiration, especially as the rapidity of the cooling process increases as the temperature falls.

The loss of heat experienced from the time of birth until the first bath has been given is enough to produce a fall in the body temperature from 99.3° F. (37.4°C.) to 96.8° F. (36° C.) and 95° F. (35° C.). The fetus, and similarly the new-born infant, immediately after birth and until the heat balance has been established, behaves like a poikilothermic animal or like those mammals which are born blind, since the heat-producing power is still at its minimum. Hence it is that during the first weeks of life ingestion of milk and the first crying spell are immediately followed by a rise in the body temperature.

The temperature varies physiologically from 97.8° to 98.6° F. (36.5° to 37° C.).

These, then, are the factors which influence the general physiological changes in weight. An unusually well-developed infant (over 8¾ lb. [4 kilos]) does not show these changes to the same extent as does a normal child of average weight (6¾ to 7½ lb. [3100 to 3400 gm.]), the loss in weight on the fourteenth day being less while the increments are greater; on the other hand, a weakly or premature child is affected very much more unfavorably, and is also much more apt to be attacked by icterus.

The influence of the mother manifests itself in the fact that the children of primiparæ, under the age of twenty and weighing less than 120 lb. (55 kilos), show the least tendency to increase their weight during the first week, and the same is true of the children of mothers who are obliged to work hard during pregnancy and who are not able to nourish themselves properly or are attacked by disease. This relation between the mother's condition and the size of the fetus enables us, if necessary on account of a contracted pelvis, to influence the weight of a fetus during pregnancy by dietetic methods (Prochownik's diet).

Conversely, the greatest tendency to increase of weight is found in children born of women weighing over 120 lb. (55 kilos) and between the ages of twenty and twenty-nine, especially of multiparæ; the latter also produce on the average more boys than girls. Vigor in the father usually compensates for the maternal weakness in the matter of the infant's weight; even the temporary condition of the father at the time of impregnation has some influence in this respect. In marriages between different races, the peculiar qualities of race, nationality, or tribe manifest themselves in this matter of the child's weight; thus, marriages between Anglo-Saxon men and Japanese women usually result unfavorably for the mother, because the broad skull of the infant is unable to pass the narrow and circular pelvis; on the other hand, marriages between Anglo-Saxons and Latins usually give favorable results.

These relations affect the absolute weight of the child at birth as well as the subsequent changes in weight; the greater the body weight of a vigorous, healthy mother, the greater is the average increase in the weight of the child; although there are certain typical differences in the average weight, depending on whether the child is the first-born or not, the first-born being usually the lightest.

The children of tuberculous or scrofulous mothers show an average deficit of 6.2 per cent. of their initial weight as late as the fourteenth day, as against 0.14 per cent. in children born of healthy mothers; while the latter put on weight at the average rate of 1¼ oz. (35 gm.) per day during the first month, and 1 oz. 28 gm.) per day during the second month, the children of tuberculous mothers on the average show no increase at all during the first month and only 62 gr. (4 gm.) per day during the second month.

The average weight of children of healthy and of diseased fathers is represented by the following proportion: 124 : 92 oz. (3500 : 2600 gm.).

Diabetes in the mother exerts an even more unfavorable influence than do the diseases just mentioned; 5 per cent. of children born of diabetic mothers die before term.

The same is true of syphilitic transmission. Children born of syphilitic mothers who are healthy at birth and remain healthy show a much smaller increase or a greater decrease in weight on the average than the children of healthy mothers. This may be accounted for in part, but only in part, by the artificial feeding.

Heavy children—over 8¾ lb. (4 kilos)—are more often born, even from primiparæ, among the better classes than in lying-in hospitals. This is due to over-feeding during pregnancy and insufficient bodily exercise.

It should also be mentioned that nature often assists the offspring of debilitated mothers at the latter's expense. Thus, the children may be born perfectly healthy even when the mother during pregnancy was insufficiently nourished or sickly, but after the birth of her infant the mother suddenly collapses and often does not recover for months, even with the most careful nursing, or else does not recover at all and falls a victim to tuberculosis.

A knowledge of these facts is important in determining the prognosis of a birth in cases of contracted pelvis and the probable effect of methods of feeding on the infant.

In general, artificial feeding in healthy children is never or hardly ever followed by the same increase in weight and general improvement as when the child is fed from the breast.

If we compare the body weights of healthy children brought up by Soxhlet's method with that of breast-fed children we find that the former regain their initial weight on the fourteenth day very much more rarely than do the latter; we also find a greater average decrease in weight: 7.3 per cent. as against 5.5 per cent. —yielding an average of 3.7 per cent. instead of 0.14 per cent. (In Soxhlet's method—sterilization—the milk, after being diluted with water and enriched with sugar of milk to make it more like human milk, is boiled from ten to twenty minutes for the purpose of killing fermentation fungi and tubercle and other bacilli). In the urine the loss of phosphorized albuminates in the form of pseudonuclein from cow casein has been demonstrated. Mother's milk is very completely utilized by the new-born during the second week, as shown by the following table (Mischel, Uffelmann, Wegscheider):

Nutritive substances in general	96.11	per cent.
Fat	96.35	"
Nitrogenous substances	93.60	"
1.486 gm. mineral salts	78.26	"
.243 gm. calcium	59.42	"
.263 gm. phosphoric acid	91.63	"

Breast-fed children show a daily increase of about 1 oz. (30 gm.) during the first and second months, while those fed artificially show at first only 6 drams (23 gm.) and later 5 drams (19 gm.). We have already shown how easily the digestive function may be disturbed in artificial feeding, either by the inability of the child to digest the casein or by the occurrence of an infectious gastro-enteritis; if, however, the infant remains well, the loss of weight is made good during the second half of the first year, when every child is capable of assimilating a mixed diet. In any case the injurious effects of artificial feeding, which rarely fail to put in their appearance during the first six months of life, tend to diminish the resisting power of the infantile organism. As the infant in this early stage is quite capable of digesting prepared starch (that is, to convert it into soluble sugar), as has been shown by experience as well as by the latest investigations, we are quite justified in adding prepared farinaceous foods to the milk as early as possible, whenever the milk alone proves insufficient. The oldest preparation of this kind is Nestlé's infant food, consisting of sterilized milk thickened with a kind of zwieback meal and a little cane-sugar. I have also obtained good results with Fürther's "Kinderzwieback," with similar preparations manufactured by Kufeke, by Wagner of Stuttgart (whose food, however, gives the urine an irritating quality that sometimes causes intertrigo), and, finally, by Theinhardt. Oatmeal mixed with boiled zwieback meal often answers the same purpose. Recently malt-soup has been given with some success to marasmic infants, and as early as the first week to infants suffering from gastro-intestinal disease. (To 24 oz.—750 gm. malt-soup add 5 oz.—150 gm. of water, so that it contains a smaller proportion of milk and flour and a greater proportion of malt extract than Liebig's extract.)

As we have seen, the new-born infant requires a large amount of heat-producing substances—3½ oz. (100 gm.) of albumin (the casein in cows' milk is very much in excess of that contained in human milk and is practically indigestible for the child) yields only as much heat as 1⅞ oz. (52 gm.) of fat, hence the infant's digestive tract is at first better adapted to the assimilation of milk rich in fat and poor in albumin. By the process of centrifugation a part of the casein can be mechanically removed from cows' milk; hence the question of artificial feeding is theoretically, at least, best solved in this way. Any dairy can manufacture this Gärtner's "Fettmilch" by means of the centrifugal machine, and the use of this modified milk undoubtedly yields very good results, but it is far from realizing the ideal of an artificial food. I have seen many children who were fed on this preparation fail to gain weight as they should, when the addition of the above-mentioned substances produced satisfactory results.

The best method of preparing artificial milk is that of Heubner-Soxhlet, and it can be prepared from good fresh cows' milk as it is delivered at our doors every day. The milk is boiled for from ten to twenty minutes (if the milk is boiled longer than this it becomes even more indigestible than it was at first), and after having been diluted according to the age of the child in the proportion of 1 : 3, 1 : 1, and, finally, 3 : 1, is enriched by the addition of 5 per cent. of milk-sugar (sterilized and chemically pure preparation of Löflund), temperature 95° F. (35° C.).

The milk is to be well shaken before it is poured into the bottles supplied with Soxhlet's apparatus, and containing from 2 to 6½ fl. oz. (50 to 200 c.c.), so that each bottle may contain the same percentage of fat.

After the mixture has been prepared according to the table, the entire battery of bottles is boiled at once from ten to twenty-five minutes, and the bottles are then closed with the automatic air-tight stoppers. The latter are not essential; it is far more important to cool the milk at once, although there is some danger of breaking the bottles. To avoid expense the mixture may be boiled in an ordinary pot, the directions being carefully followed.

It is one of the most important duties of the state to keep up a high standard of cattle by constant addition from healthy districts and the importation of good Swiss and Dutch or other breeds from low countries, to insist on proper feeding and care, to discourage the custom of keeping cows in stables or pasturing them on lands overgrown with weeds unfit for the production of milk, and, finally, to exclude all but the best quality of milk from the general market, as was done with great success by a private individual in Berlin. Like many other hygienic regulations this matter should be subject to the immediate supervision of public boards of health. The inability to nurse children is increasing to an alarming extent in many regions; even the rural population is deteriorating in this respect, and a dearth of wetnurses is beginning to be felt. Physicians nowadays often meet with country women suffering from so-called nervous dyspepsia, chlorosis, and neurasthenia, symptoms which are without exception to be attributed to diminished powers of resistance.

The relative deficiency in carbohydrates in the milk mixture which I have described is corrected by the addition of 5 to 6 per cent. of milk-sugar. In spite of this, however, most children do not thrive as they should, and if the number of feedings is increased, or more concentrated milk is used, the digestion usually suffers. In such cases the preparations of milk and zwieback meal should be resorted to, or, if possible, a good wetnurse should be procured. This is often difficult, troublesome, and expensive, as it is not always possible to be sure of the health and moral fitness of a wetnurse, but if these conditions can be obtained, it is the most rational method of feeding. From an ethical point of view the question is frequently hard to decide, as it not rarely involves the entire abandonment of the wetnurse's child. A physician is never justified in procuring a healthy nurse for a syphilitic child, or even in giving his consent to such a procedure.

A good wetnurse should possess the following qualifications: Her general condition must be perfect, above all, tuberculosis and syphilis must be excluded; the breasts must be well developed, both as regards the glandular structure and the nipples. The size of the mamma is frequently due to excessive adipose tissue, as we often have occasion to see in the beer districts in Bavaria. The physician will do well to reserve his judgment in the case of an unknown nurse until the following day, as employment bureaus very often prepare the nurses by giving them large amounts of beer and taking away the child; the fitness of a nurse is always best determined by the examination of her own child. The milk should contain at least so much fat that after twenty-four hours one-tenth of the volume rises to the surface in the form of cream. The diet and general care of the nurse should be such as she has been used to before, as far as the altered circumstances will permit. Nurses are very apt to become lazy and careless about their persons; they should be carefully looked after and made to do some light form of house-work. A nurse's disposition should be gentle and good-natured, and she must not be the subject of any nervous trouble. Some of these qualities ought also to exist in mothers if they are to be allowed to nurse their own children.

If for any reason a nurse is not wanted or cannot be obtained, the addition of natural milk fat to the milk, diluted as described above, furnishes a satisfactory method of increasing the nutritive value of the milk-and-water mixture without injuring its digestibility. Among preparations of this kind we have Biedert's "Rahmgemenge" (cream mixture) and Soldner's "Rahmkonserve" (condensed or preserved cream—Löflund).

The use of these preparations depends on a chemical comparison between human milk and cows' milk, it being found that the chemical constitution, so far as we know, of cows' milk approaches that of human milk if 1½ gr. (0.1 gm.) of nitrogen from albumin, 1⅘ drachms (7 gm. cream fat), 6 drachms (25 gm.) of sugar of milk, and 8 fl. oz. (250 c.c.) of water are added to 8 fl. oz. (250 c.c.) of cows' milk—which contains 18½ drachms (1.2 gm.) nitrogen from albumin, 2¼ drachms (8.7 gm.) fat, 3 drachms (11 gm.) carbohydrates, 26 gr. (1.7 gm.) ash. In practice such a mixture is obtained for a child fourteen days old, for instance, by mixing one-fourth of a quart (liter) of cows' milk with 7½ fl. oz. (220 c.c.) of water, 7 drachms (28 gm.) of "Rahmkonserve," 3½ drachms (14 gm.) milk-sugar, making in all 18 fl. oz. (530 c.c.).

The Subsequent Care of the Infant.—Immediately after birth the eyes are to be wiped clean. If there is any suspicion of gonorrhea, one to two drops of a 2 per cent. solution of argentic nitrate are to be instilled into the eyes and moist compresses put on. The navel readily becomes infected and the following directions are therefore to be observed:

1st. The nurse is to attend to the child first, and see that her hands and especially her finger-nails are clean.

2d. The stump should dry as quickly as possible; this process of mummification is assisted by dusting the stump with any desiccating and disinfecting powder (the author prefers nosophen and starch, or bismuth and starch, or powdered salicylic acid) and wrapping it loosely in salicylated cotton. Ahlfeld suggests alcohol compresses.

3d. The child is to be sponged twice daily, and not to be given a full bath until the cord has come away and the wound is closed; after that it may be bathed in water at the temperature of 95° F. (35° C.). Many infants bear warm baths very badly.

On the first day the proper evacuation of meconium and urine must be attended to. The child is to be fed every two or three hours, the first feeding to take place twelve hours after birth, either at the breast or with the bottle, the diaper being changed first. The mouth is to be wiped with a soft moist cloth *before* the child is fed. In the intervals between feeding the infant must not be disturbed. It ought to be part of the infant's education, as it is a sign of its good health, that it sleep uninterruptedly from 10 or 11 o'clock at night till 5 o'clock in the morning, and this may be achieved by the end of the first month. The habit of carrying the baby about and singing it to sleep is a senseless maternal weakness and one that most nurses are unfornately addicted to. The mother or nurse should never be allowed to take the child into bed with her, either because of laziness or for the purpose of warming it, as it is a most dangerous practice.

§ 10. HYGIENE AND MANAGEMENT OF PREGNANCY.

The management of a pregnant woman has for its main objects the alleviation or prevention of certain physiological disturbances which are most apt to occur and are most marked in neurotic individuals, the preparation of the woman for the birth and subsequent feeding of her child, and, finally, the prevention of injuries which are liable to occur as pregnancy advances, or at the time of parturition, or during the puerperium.

Above all, the physician should combat the idea that pregnancy is an abnormal condition and that the pregnant woman should be as careful of herself as if she were ill. On the other hand, she should avoid anything like dissipation and live a regular life. By this means we may hope to avoid any serious disturbances during pregnancy, such as vomiting, constipation, or attacks of vertigo. The diet should consist of easily digestible and non-irritating foods that have no tendency to produce fermentation and flatulency; alcoholic beverages should be avoided. The bowels must be regulated by appropriate vegetable diet and, if necessary, by the administration of enemata or even mild purgatives. The clothing should be loose and comfortable. Corsets should be avoided on account of the downward pressure which they exert; they may be appropriately replaced by elastic corset-waists to which the underclothing can be buttoned. All pressure on the breasts must be avoided. If the abdominal walls are weak, binders should be worn during the second half of pregnancy to prevent the development of "pendulous abdomen." Mental depression is best avoided by appropriate feminine duties and pursuits such as keep body and mind occupied, and furthermore by the assurance, based on accurate examination, that everything is in good order. The woman should be provided with sensible companionship and light and agreeable entertainment, all gossiping and recounting of horrible deliveries being strictly forbidden; and, finally, she should be assured that all the necessary preparations for a proper delivery have been carefully attended to. If it seems advisable, admittance to a maternity hospital will contribute greatly to preserve the patient's peace of mind.

In the care of the skin of the breasts and abdomen the most important point is a daily sponging with cool or tepid water. Hot baths I do not consider necessary except for the purpose of producing diaphoresis in cases of renal disease; for purposes of cleanliness a full bath every week or every other week in addition to the daily sponging is quite sufficient. The last bath should be taken shortly before the onset of labor-pains. I do not recommend the use of astringent lotions on the nipples, but gentle manipulation is often necessary to draw out one that is imperfectly developed. Above all, cleanliness is to be enjoined.

In the examination of a pregnant woman, which includes a careful examination of the size and shape of the pelvis, the attention should be directed, above all, to the kidneys and to the heart, and, if either of these organs is found insufficient, energetic treatment is to be inaugurated at once. In chlorotic women it is not advisable to resort to forced feeding toward the end of pregnancy, as such a course rarely benefits the mother, while it leads to excessive growth of the fetus which may seriously embarrass parturition.

§ 11. SYMPTOMATOLOGY AND MANAGEMENT OF THE PUERPERIUM.

The puerperium includes the involution of the generative organs, the establishment of lactation, and the resulting changes in the circulation and in metabolism. In civilized women rest in bed for from one to two weeks (in the dorsal position during the first twenty-four to twenty-eight hours) is necessary for the accomplishment of these changes. It cannot be denied, however, that strong, healthy women who are nursing their children are quite able to return to their ordinary occupations on the third or fourth day, and that the involution of the organs progresses even better under such circumstances, providing, always, that no infection has taken place. Küstner made some experiments in this line in his clinic with very good results. Elasticity of the abdominal muscles, ligaments, and blood-vessels is a necessary prerequisite.

First Day, Second Half.—Peptone and sugar are present in the urine, sometimes there is retention. Warm irrigation and compresses are useful; the catheter should be used. Afterpains occur in multiparæ. Diaphoretics should be given. The uterus is anteflexed and flattened from before backward, its length is appreciably diminished; the fundus is almost at the level of the umbilicus. Pulse from 40 to 70; bloody lochial discharges.

Diet during the First Three Days.—Two cups of milk, one soft-boiled egg, a few zwieback, given in five meals. At night water or milk.

Second Day.—If the bladder is empty the fundus of the uterus stands about a hand's breadth above the symphysis. The dorsal position should be maintained until the third or the fifth day; after that the woman should lie on her side, especially if there is any tendency to retroversion or retroflexion. The bladder must be emptied at least twice a day. After each evacuation the vulva should be irrigated either with boiled water or with 0.5 per cent. sublimate or 1 to 2 per cent. carbolic-acid solution or 0.5 per cent. lysol solution, and wiped dry with cotton. If there are any excoriations or fissures about the vulva, or sutured perineal tears, they must be dusted with nosophen powder (dermatol, iodoform, and so on) or covered with airol or zinc paste, after which a vulvar pad is placed on the labia. Diaphoresis should be encouraged. In multiparæ lactation begins.

In the infant's umbilicus the line of demarcation separating the mummifying umbilical cord appears, and is attended with slight exudation; the cord is to be dusted with salicylic powder, or nosophen, or bismuth and starch powder and loosely wrapped in cotton; the child is never to be completely immersed in the bath until the navel is entirely healed, so as to keep the cord dry. The child is fed for the first time twelve hours after birth, and its navel and eyes should always be attended to *before* the mother.

Third Day.—The breasts have reached their highest degree of distention; the fundus is a hand's breadth above the symphysis. Beginning of serous lochia, which are of a pale meat color and have a peculiar stale odor. If the lochia remain bloody for several days, and afterpains continue, it is a sign of endometritis. Under such conditions the discharges readily become fetid. Primiparæ suffer less from afterpains and the bloody lochia last longer, because involution progresses more slowly. The physiological variation in temperature during these days is between 98.6° and 100.4° F. (37° and 38° C.); a temperature above 100.4°F. (38° C.) is to be regarded as febrile. Evacuation of the bowels must be carefully attended to.

Fourth Day.—The fundus uteri, in other words, the highest point of the posterior wall, is midway between the symphysis and the umbilicus. The colostrum changes to thin, watery milk. Most abundant milk secretion; diminution of the lochia. Greatest percentage of nitrogen in the urine.

The umbilical cord in the child separates, although sometimes not until the sixth day. Up to this time the alvine discharges have consisted of meconium (the saline colostrum acts as a purge); from now on the stools are yellow, like saffron or yolk of egg, with very minute sediment; if the child is fed on cow's milk the stools contain coarse, firm particles. Up to this time the body weight diminishes. Temperature—98.4° to 100° F. (36.8° to 37.7° C.)—highest after nursing, that is, usually at noon. Physiological icterus most intense. From now on daily full bath at 89.2° F. (31.7° C.). Some children do not bear this very well, and must be washed daily in tepid water and given a full bath only once a week.

Diet from the Fourth to the Sixth Day.—Three cups of milk (with a little coffee or tea), one plate of bouillon, two saucers of oatmeal or other cereal, one egg, a quarter of a pound of chopped white meat. Three times a day a zwieback or a roll, once a day some digestible preserves (apple). The above to be given in five meals. At night sugar-water with lemon, or milk, possibly a glass of good Burgundy, or broth.

Eighth Day.—Lochia alba begin. The cervix usually admits one finger and the placental site can be felt as a roughened area; the uterus is anteflexed; the fundus three fingers' breadth above the symphysis. Colostrum corpuscles have disappeared from the milk.

The child in one-half of the cases regains its original weight. The temperature becomes more stable.

Ninth Day.—The fundus uteri or, if the anteflexion is marked, the highest point of the posterior wall is behind the symphysis. The external os begins to close; the vaginal portion of the cervix begins to project freely into the vagina. After this day the woman may get up if she wishes to. Great care is necessary to guard against attacks of syncope and embolism.

Diet for the Seventh to the Twelfth Day.—Two cups of milk (with a little coffee or tea) or cocoa. Three times a day bread of some sort; one egg. Twice a day rice, farina, oatmeal, whole oats, or, if desired, a little scraped raw meat, ham, or beef-steak; a quarter of a pound of roast white meat once a day; some digestible vegetable (rice or farina); preserves; one plate of bouillon once a day; broth; possibly two glasses of Burgundy or lemonade. *Give the above in five meals.* At night, milk.

Twelfth Day.—It is advisable for the woman to get up. She should not remain in bed any longer except for a special reason; in weak individuals a longer rest in bed leads to general relaxation, especially of the pelvic organs. After the third week the uterus sinks below the pelvic brim.

The child now gains weight at the average rate of ¾ to 1¼ oz. (20 to 35 gm.) per day. It should be put to the breast every three (or two and one-half) hours or given 2¾ to 3¼ fl. oz. (85 to 110 c.c.) of the milk-mixture, 3 : 1 milk. It must now be accustomed to sleep through the night from 10 P. M. to 5 A. M. without any food. During the day it should be allowed to sleep as much as it pleases.

Fourth to Sixth Week.—The involution of the uterus is completed. The lochial discharges cease. Anatomically the placental site is still visible as a marked prominence.

At the end of the first month the child weighs on the average between 7¾ and 8¾ lb. (3.5 and 4 kilos), after six weeks, from 8¾ to 9¾ lb. (4 to 4.5 kilos). Milk-mixture, 2 : 1 milk, 24 to 27 fl. oz. (700 to 800 c.c.).

Sixth to Eighth Week.—Return of menstruation in those women who are not nursing their children. In debilitated women or in those who are suffering from metritis this period is apt to be very profuse.

The child weighs from 9¼ to 10½ lb. (4¼ to 4¾ kilos). Milk-mixture, 1 : 1 milk, 27 to 31 fl. oz. (800 to 900 c.c.). Artificially fed children weigh a little less, but they usually make up this difference at the time when all children begin to take a mixed diet.

During the **third month** the mixture should be 1 : 2 milk, 31 to 34 fl. oz. (900 to 1000 c.c.). After that, 1 : 3, and the proportion of milk gradually increased to 1 quart (1000 c.c.). During the fifth or sixth month in many cases cows' milk can be given (1 quart = 1000 c.c. roughly), after the eighth month, 2¼ pints (1200 c.c.) of milk.

Weaning, or, in the case of artificially fed children, the change to mixed diet, should be effected from the ninth to the twelfth month, depending chiefly on the time of the first dentition, which varies with the constitution. The diet should consist of 2¼ pints (1200 c.c.) of milk, and in addition, eggs, bouillon (the child may be allowed to suck pieces of meat), purée of meat, various kinds of soft food, spinach, apple-sauce, and orange-juice.

TABLE OF DENTITION.

6th to 9th 5th to 7th	month, the two central lower incisors,	by the end of the first year all the incisors have erupted.
8th to 10th	month, the two central upper incisors,	
12th to 15th	month, the two lateral upper incisors,	
11th to 12th	month, the two lateral lower incisors,	
14th to 16th	month, four bicuspids.	
18th to 20th	month, four canines.	
22d to 26th	month, four molars.	

genital infection. So-called milk-fever, in the ancient sense of the term, does not exist. In the relaxed condition of the genitalia, especially in marked anteflexion of the uterus, a fever due to absorption sometimes makes its appearance on the third or fourth day and lasts from twenty-four to forty-eight hours. As soon as the first symptoms of distress, such as restlessness and insomnia, make their appearance, it is most important to induce thorough diaphoresis, defecation, and diuresis.

The woman should avoid all sudden movements when she sits up or gets up out of bed, on account of the danger of pulmonary embolism from a thrombus at the placental site, especially after endometritis. Such an accident may lead to the gravest complications and has often resulted in sudden death. On the other hand, it is advisable to let the puerpera sit up under proper precautions during the first days, to prevent stagnation of the lochia in the vagina.

Lactation next demands our attention. I have already mentioned the desirable qualities in the mother or nurse who is to suckle the baby, as well as the care demanded by the mammary glands and nipples during pregnancy. When the woman begins to nurse, the nipples and the clothing with which they come in contact must be kept scrupulously clean to prevent the entrance of the Oïdium albicans into the infant's mouth. The mother should lie on her side and hold the child in the hollow of her arm. Mother and child must never sleep in the same bed. This caution is to be strictly enforced in the case of nurses. If the nipples are unfit for sucking and there is still a plentiful supply of good milk, a false nipple should be used, either one of the old kind, made of rubber, or one made of glass. Auvard's is the best for weakly children, because it permits the mother to assist in drawing out the milk. All such apparatus must also be kept scrupulously clean. The breast is to be washed after every nursing. Weakly or premature children are to be fed with a spoon, which must also be kept clean.

If milk secretion is insufficient, it can be increased by massage of the relaxed abdomen and the application of a firm binder, supplemented with a weight applied on the abdomen, by the administration of somatose, and by beginning twelve hours after birth to put the child to the breast regularly.

Menstruation, which occurs after six weeks in 45 per cent. and regularly in 20 per cent. of puerperal women, does not affect either the quantity or the quality of the milk, provided the milk secretion is good. Even the occurrence of pregnancy exercises no injurious influence on lactation in healthy mothers, nor on the development of the fetus; I saw a case in which a mother who did not know she was pregnant nursed her child during the first four months of pregnancy. The physician should therefore be guided in his advice by the constitution of the individual. Nursing need not necessarily be forbidden after the occurrence of pregnancy. Pregnancy is most apt to occur when the menstrual period reappears regularly, that is to say, in 20 per cent. of all nursing women. If on account of inflammatory conditions or for any other reason the child has been weaned, and its nutrition is thereby very much reduced, it is possible to restore the milk secretion even after weeks of inactivity by again putting the child to the breast.

PART II.

PATHOLOGY AND TREATMENT OF PREGNANCY, LABOR, AND THE PUERPERIUM.

CHAPTER V.

THE PATHOLOGY OF PREGNANCY, INCLUDING ABORTION AND PREMATURE LABOR.

§ 12. ANOMALIES WHICH LEAD TO ABORTION.

By abortion is meant the premature expulsion of the ovum before the formation of the placenta is completed; that is to say, before the fourth month; after that period we speak of premature birth.

DIAGNOSIS AND TREATMENT OF ABORTION.

The beginning of an abortion is diagnosed by the bright red color of the vulva and vaginal walls, the softening and enlargement of the uterus, especially in the anteroposterior diameter, giving it a balloon-like shape, and by the occurrence of persistent hemorrhage. In some cases there is a history of preceding amenorrhea.

(*a*) If the external os is closed the treatment must be expectant. If the abortion is due to an accident, such as a fall, and not to constitutional disease, the prospect of bringing the embryo to maturity is good, especially in vigorous women, even without protracted rest in bed, as I can illustrate by the following case:

A hotel-keeper changed her residence to another town at a time when without knowing it she was in her second month of pregnancy. Before her departure she fell from the fifth rung of a ladder and immediately had a fairly copious hemorrhage from the genitalia, which persisted during all the time she was engaged in packing and in making the journey and for three weeks afterward, at which time the woman slipped as she stepped out of the bath-tub and again fell to the floor. The hemorrhage became more profuse and slight pains resembling labor-pains made their appearance. When I told her my diagnosis she was very much astonished to learn that she was pregnant. She would not hear of going to bed, partly because she was not quite convinced of her pregnancy and partly on account of the duties demanded of her by her business. I administered opiates per vaginam and went away expecting to be called again. I was not sent for again, however, until I was called in to deliver a healthy and well-developed boy at term. The placenta showed no changes. I had convinced myself at the time by an examination with the speculum that the hemorrhage came from the uterus.

Expectant treatment consists in ordering the patient to bed for a period not longer than eight days, and in administering opiates in bougies, or vaginal douches of tepid boiled water with the least possible amount of pressure. If the hemorrhage is profuse and persistent, cold irrigations should be given and compresses applied to the abdomen. As a matter of course, strict antiseptic precautions must be observed in making explorations or other manipulations so as to minimize the danger of infection.

(*b*) If the external os is dilated and the tip of the ovum projects into the cervical canal, we have to deal with an advanced abortion which cannot be averted. In such a case removal of the ovum is indicated, it being immaterial whether the hemorrhage is profuse, as is usually the case, or slight (for technique see *Atlas of Labor and Operative Obstetrics*). The cervical canal and vagina are packed with tampons of sterilized gauze (iodoform or nosophen); and ergot, ergotin, or quinine sulphate (several doses of gr. viij = 0.5 gm.) are given by the mouth. If the labor-pains are strong, tampon and ovum are expelled from the uterus. If, on the other hand, labor-pains cease, the ovum is found behind the tampon and can be easily removed with the abortion forceps. Complete expulsion of the uninjured ovum is not to be expected, as a rule, after the fourth month. Later than that the amniotic sac first ruptures; this is followed by the appearance of the fetus, and finally the placenta comes away.

(c) If the product of conception has already been expelled, the cervical canal is found dilated, the body of the uterus is usually hard and contracted by the severe labor-pains, although it may continue to bleed in spite of the pains, and the hemorrhage will certainly recur as soon as the contractions cease. Digital exploration reveals a rough surface with blood-clots and epithelial shreds, which under the microscope are seen to consist of chorionic villi and decidual tissue (see Figs. 15 and 16).

If portions of the membranes remain behind, the hemorrhage persists, the blood being mixed with brownish particles, which eventually give off a fetid odor. Under these conditions, whether we have to deal with a fresh case accompanied by profuse hemorrhages, or septic infection has occurred from the remains of the fetal membranes, the uterus is to be evacuated by means of bimanual compression, or it may be rapidly dilated by means of conical metal dilators of various sizes, after Fritsch and Hegar. If expression fails to remove the placental remains, the interior of the uterus must be scraped with two fingers or with a blunt curette (see *Atlas of Labor and Operative Obstetrics*).

In cases of putrid abortion the author recommends vaporization, but not before the length of the uterus has been accurately determined, and only with a heated instrument—that is to say, not directly with steam—and only when it is performed by a practised hand. These procedures are to be followed by irrigation with 2 per cent. solution of carbolic acid, packing of the uterus with iodoform gauze for twenty-four hours, the administration of ergotin, and rest in bed for a week. If there is fever, Priessnitz compresses and mild laxatives are indicated.

If it is impossible to arrest the septic process, total extirpation of the organ may have to be considered.

If portions of the membranes remain within the uterus, they tend to keep up the hemorrhage, and the constant deposition of fibrin may lead to their organization, so that the entire uterine cavity may be filled with a plastic material. This process may take place if portions of the placenta remain after the expulsion of an older, or even of a mature, ovum. Such partial retention of the placenta leads to what is known as a placental polyp. If an ovum is expelled or removed *in toto,* the uterus need not be curetted, as any remaining portions of the decidua do not in the least interfere with the regeneration of the mucous membrane. Tamponade is required only after hemorrhages, or after curettage of the uterus performed for the purpose of removing larger adherent portions of the membrane. If the temperature rises, the tampon is to be at once removed. The mechanism of the separation of an aborted ovum is the same as that of an older placenta (see Fig. 11 in the text). A retroplacental hematoma forms usually at the edge of the insertion of the ovum in the decidua vera, and separation begins either at the margin or at the central portion of the insertion. In the former case a part of the ovum nearest the true maternal area of separation first appears in the cervical canal. In the latter case the villous decidua reflexa is the first to appear. If in the latter mode of separation the fetal membranes rupture, the ovum is, of course, expelled first, and the free portions of the fetal membranes become wrapped about the massive portion of the ovum toward the fundus; in other words, the fetal surface of the amniotic sac prolapses.

If the embryo is retained in the uterine cavity, it becomes macerated and then undergoes absorption. The fetus may undergo mummification (fetus papyraceus), but on the admittance of air or pathogenic organisms putrefaction takes place. Thus the fetus may be retained *in utero* beyond the physiological duration of pregnancy (missed abortion).

Lithopedia, which are sometimes found in the uterus, are probably derived from tubal or other extra-uterine pregnancies, or from amniotic sacs within rudimentary cornua.

The *treatment* does not, as a rule, end with the removal of the ovum, because the causes of abortion, which are too often regarded as its consequences, still persist. As a rule, they consist in inflammatory conditions of the maternal or fetal membranes, or in general constitutional diseases such as syphilis or perhaps tuberculosis, which find their local expression at this point, or in acute febrile infectious diseases or in excessive physical or mental excitement (circulatory disturbances), or, finally, in displacements and tumors in the various portions of the genital tract.

Accordingly, we observe after an abortion persistence of the congestion and chronic inflammations, catarrhal hypersecretion, menorrhagia, displacements of the uterus, either by a flexion of the imperfectly involuted walls or by adhesions.

One abortion predisposes to others, hence in a succeeding pregnancy preventive measures are indicated. One of my patients had four abortions following four normal pregnancies. In the fourth month of her ninth pregnancy I found a perineal tear of the second degree, inversion of the interior vaginal wall with a cystocele, and a deep ulceration of the external os with marked ectropion of the cervical mucous membrane. I applied a Mayer ring-pessary and pregnancy went on to term, although hemorrhages had already occurred.

In another case in which there were hemorrhages in the sixth month of pregnancy, the woman having previously had an abortion, the hemorrhages were controlled by invigorating measures (iron, massage) and by the use of vaginal irrigations with lukewarm emollient solutions.

The morbid anatomy of the aborted ovum varies with the cause of its expulsion.

(1) **Subchorionic,** that is to say, **decidual hemorrhages, are apt** to form in general infectious diseases, especially acute diseases attended with high temperature (typhus,

cholera, variola, influenza), and, by interfering with the circulation and possibly by the transmission of toxins, bring about the death of the fetus. Direct infection, on the other hand, by the transmission of pathogenic micro-organisms to the fetus, which has been proven experimentally and clinically (pockmarks in the new-born infant), may be survived.

These hemorrhages into the decidua (most frequently into the serotina) are found either in the stroma, when they force the fibers and large decidual cells apart, or in the gland-follicles, or in preformed invaginations of the fetal membranes which continue to grow after the death of the fetus—the so-called hematoma moles described by Breus. They produce nodes the size of a hazelnut in the fetal membranes, and these, in addition to infecting the fetus, may lead to malformations by their interference with the fetal movements (Figs. 88, 91, and 92; Fig. 11 in the text).

These hemorrhages usually bring on an abortion before the fourth month. As a rule, the embryo undergoes absorption—the amniotic fluid is turbid and brownish in color, remains of the umbilical cord and of the allantoid vesicle are seen—or the fetus dies as the result of torsion of the cord and undergoes maceration. The ovum may continue to grow by itself.

In other cases a lymphoid exudation separates the amnion, and the ovum may be expelled either in its own fetal membranes, that is, the chorion and amnion, or in the intact amniotic sac alone (Fig. 12 in the text). Expulsion with the maternal decidua, that is, with a complete cast of the uterine body in the form of detached decidua vera, is illustrated in Figs. 67, *a*, and 67, *b*; we see that the ovum in the first and second month is smaller than the uterine cavity (Figs. 17 and 18), showing that the latter is growing actively.

Cf. FIG. 67, *a*. *Triangular Piece of Decidua Vera Expelled in an Extra-uterine Pregnancy.*—The external surface is rough, the internal surface shows the mouths of ducts and numerous plications.

FIG. 67, *b*. *The Same.*—In this case the decidua vera has formed below the internal os in an expanded portion of the cervix, an

Plate 36.

FIG. 81. **Necrotic Decidua of a Hematoma Mole Retained** *in utero*, so-called missed abortion (original water-color, natural size, from the author's own case).

Plate 38.

FIG. 88. **Mummified Fetus with Retained Abortive Ovum** (belonging to Fig. 81).—The ovum grew with the fetus until the third month, after which time amenorrhea continued ten months longer. Thus, after an interval of thirteen months, the menstrual flow reappeared with great pain, portions of the necrotic decidua serotina being discharged at each period. The ovum itself, however, was retained two months longer, when it was finally expelled with labor-pains and a moderately copious menstrual flow. The decidua (Fig. 81) was also necrotic. The rest was filled with coagulated hematomata, so that the chorion bulged into the amniotic sac (Fig. 88). Hematomata are also seen on the maternal surface. The amniotic sac is filled with dry masses of clotted blood, the remains of which can be seen in the illustration as reddish nodules covering the irregular amnion and depriving it of its luster. The amniotic fluid was entirely absorbed. The fetus measured about 3¼ in. (8 cm.) in length, was much deformed, and showed signs of an inflammatory process which had evidently made its appearance late. The left foot had grown fast to the right leg.

In the Munich Gynecological Clinic there is a fetus which presents similar abnormalities. In this case the umbilical cord passes through the femoral ring, a proof of the late development of the condition. The right eye and the nose were covered over with membranous bands, the fingers and toes were grown together, the body was mummified, the umbilical cord twisted, the torsion being greatest at the abdominal extremity. Missed abortion takes place when the fetus and chorion gradually die, as in chronic disease of both parents.

Plate 39.

FIG. 89. **Hydatid Mole** (original water-color).—Some normal placental tissue is seen between the cystic myxomatous chorionic villi on the external surface. The color of the surface of the villi corresponds to their degree of vascularization. A few of the cysts are attached to pedicles formed of chorionic villi. A large percentage of the placenta was normal and had sufficed for the nutrition of a well-formed fetus which was born prematurely. The free membranes and the amniotic cavity show nothing abnormal.

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exceptional condition of affairs. (Both original drawings after preparations at the Munich Gynecological Clinic.)

After the fifth month the amniotic fluid is, as a rule,

Tab. 38.

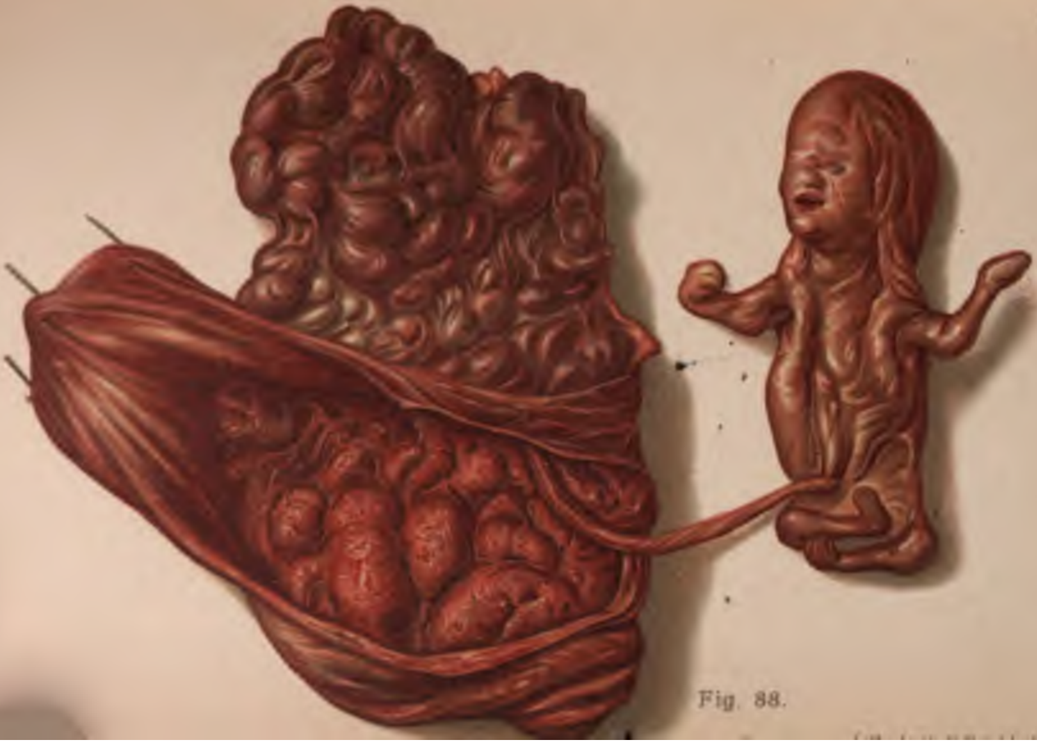

Fig. 88.

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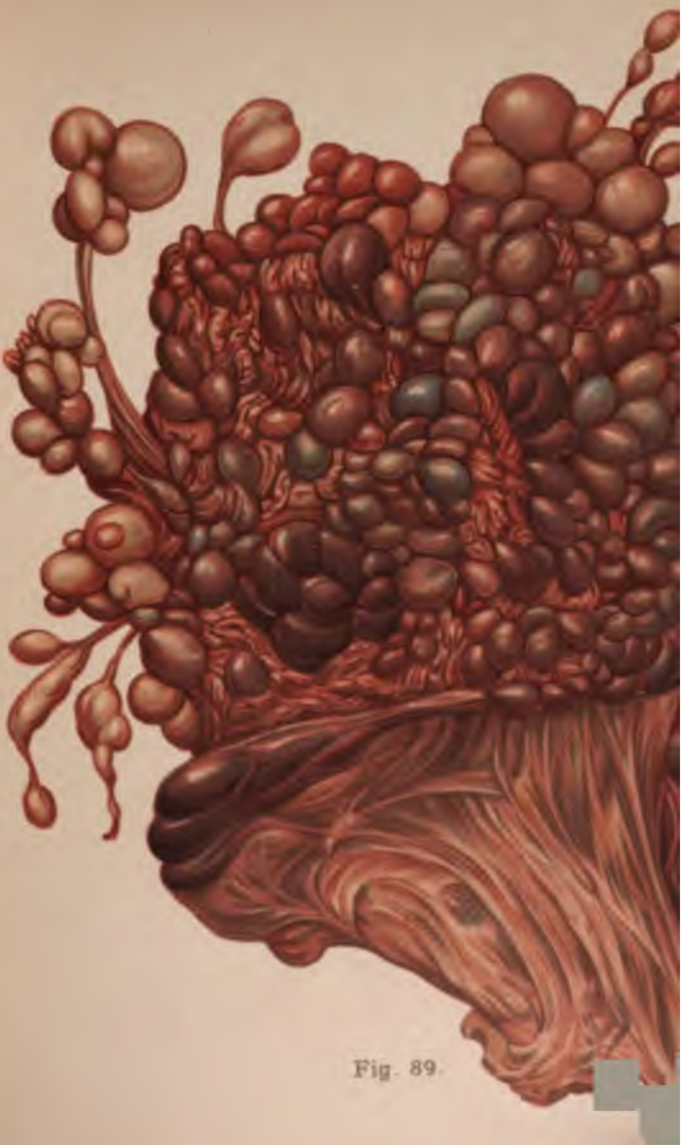

Fig. 89.

Lith. Anst. F. Reichh

discharged before the expulsion of the ovum takes place; hence a perfectly preserved ovum from this period on is very rare. In Plate 5, Fig. 12, a three-months' ovum is

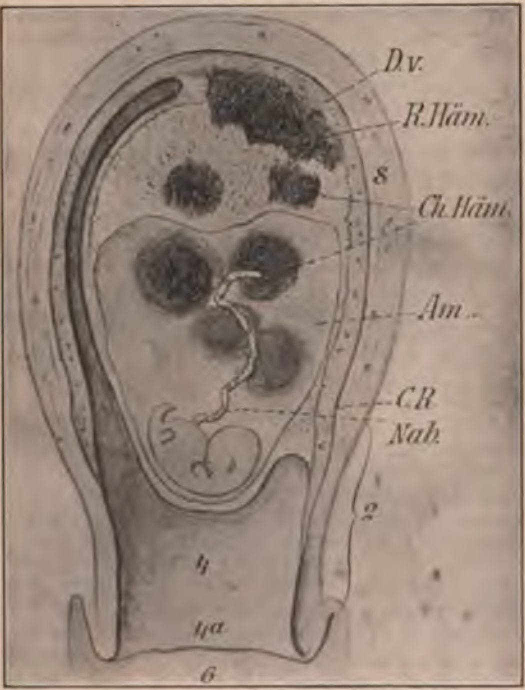

FIG. 11.—Beginning abortion after subchorionic decidual hemorrhage (*Ch. Häm.*), partly seen through the amniotic sac (*Am.*) and partly cut through. The largest hemorrhage is in the decidua vera (*R. Häm.*), and represents a kind of retroplacental hematoma, which increases as the ovum separates. The umbilical cord (*Nab.*) of the fetus is twisted, its insertion corresponds with the blood-clot, and thus leads to circulatory and respiratory disturbances which result in excessive twisting of the cord. The decidua vera (*D. v.*) extends to the internal os.

seen artificially opened; the decidua reflexa is torn into shreds and can easily be distinguished from the chorion (see also Fig. 8). In Fig. 13 is seen a completely de-

Plate 40.

FIG. 90. **Decidual Endometritis** (original drawing): 1, dilated gland-follicles with desquamated epithelium; in hypersecretion these glands discharge their contents (as shown in numerals 9 and 10) between the decidua reflexa and the decidua vera into the free lumen of the uterus—*hydrorrhea gravidarum;* 2, chorionic villi embedded in partially disintegrated decidual tissue (3); 4, intact chorionic villi lying in the free intervillous spaces (filled with maternal serum or blood), either in close apposition or adherent to the decidua vera; 5, small vascular villi branching from a large attachment-villus (6), the latter gradually merges into decidual tissue; 7, capillary vessels in the inflamed interstitial portion (3 and 9) very much dilated (not so much as a result of the inflammation as of pregnancy); 8, glandular endometritis; 9, interstitial endometritis with areas of round-celled and leukocytic infiltration; 10, decidua reflexa merging into decidua vera; 11, a gland with intact cylindrical epithelium from that part of the uterine cavity which is not filled with the ovum, although forming a part of the decidua vera; 12, hypertrophied decidual tissue forming polypoid or bridge-like excrescences, and showing a telangiectactic tendency (7). (For the chorionic villi, cf. Figs. 16 and 91.)

Plate 41.

FIG. 91. **Subchorionic,** that is, **Decidual Hemorrhage** (original drawing from the author's own microscopical preparation): 1, papilla of decidua vera; 2, extravasation in the decidual tissue, forcing the fibers of the stroma apart at 3; 4, thrombus of the intervillous space with normal chorionic villi (5) lying in juxtaposition with the decidua vera. According to the latest investigations the chorionic villi are not covered with cuboidal epithelium as was formerly supposed, but with a layer of protoplasm through which nuclei are scattered.

Plate 41.

FIG. 92. **Subamniotic so-called "Fibrin," with Cysts and Extravasation** (original drawing from the author's own microscopical preparation): 1, single layer of cuboidal amniotic epithelium; 2, connective tissue; 3, so-called chorion cells, partly degenerated and converted into fibrin-like masses with parallel fibers as the effect of amniotic and intra-uterine pressure (4); 5, homogeneous masses consisting of necrotic villi; 6, serous cysts without any protoplasmic investment (8), sanguineous cysts (6 and 8) lying within the degenerated masses of cells; 7, accumulations of round cells; 9, intervillous thrombus in the neighborhood of the necrotic villi (11), which have run together by necrosis of their protoplasmic covering (12); 10, normal vascular villi; 13, decidual papilla with large capillary blood space (14) and gland (15).

Tab. 40

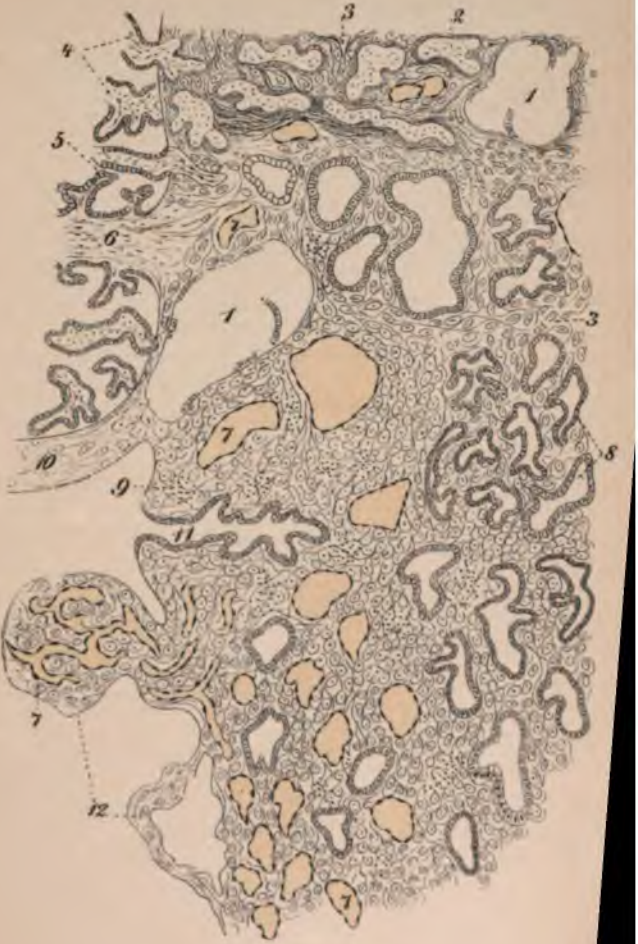

Fig. 90.

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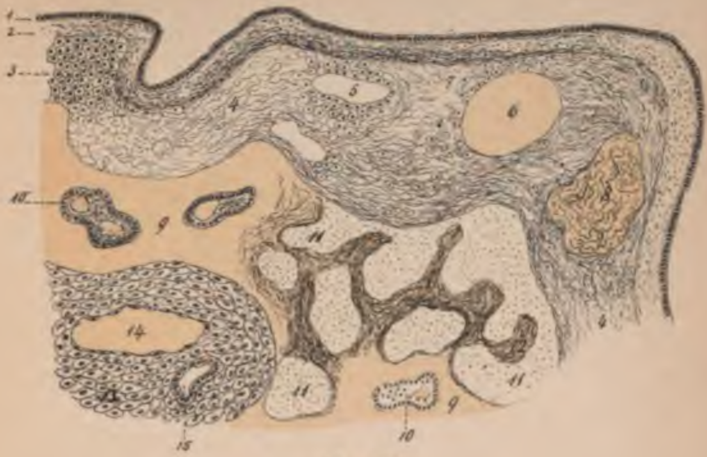

Fig. 91.

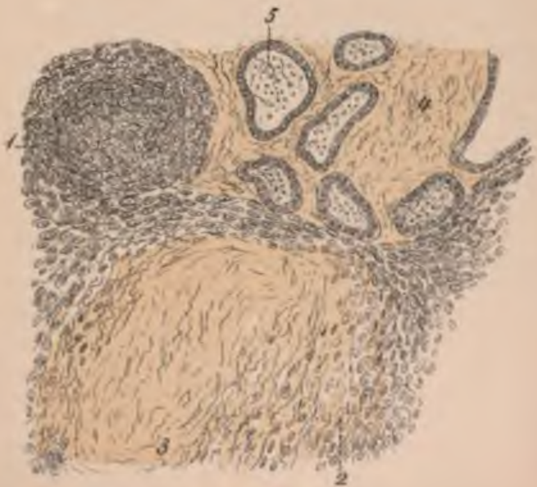

Fig. 92.

Lith. Anst F. Reichhold

veloped placenta serotina and the torn chorionic membrane, which has undergone involution and has become united with the decidua reflexa, and finally, the amnion of a four-months' ovum. In rare instances the fetus may be expelled with the amniotic sac intact, the latter separating from the chorion, and the umbilical cord becoming severed from the chorionic membrane (Fig. 12 in the text).

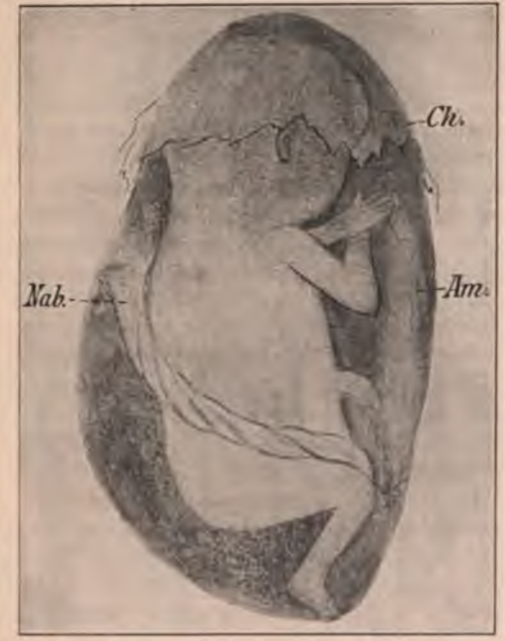

FIG. 12.—Intact amniotic sac (*Am.*) expelled in the premature delivery of a seven-months' fetus. Above we see a fragment of detached chorion (*Ch.*), to the left the insertion of the cord (*Nab.*) where it has been torn away from the serotina. In most cases a fetus of this kind shows pathological changes of some duration (original drawing from a preparation at the Munich Gynecological Clinic).

The term **blood-moles** is applied to retained decidua when it becomes hemorrhagic and is subsequently expelled separately.

Special pathological forms of abortion are produced either by inflammations of the endometrium or by general diseases, such as syphilis and eclampsia.

Two kinds of inflammation of the uterine mucosa are distinguished, that of the glandular portion and that of the connective-tissue stroma, termed, respectively, endometritis glandularis and interstitialis. The etiology of the two varieties is the same. Both may arise from chronic hyperemia, that is to say, from circulatory disturbances of a non-infectious origin or from infection (gonorrhea-tuberculosis, sepsis).

Such forms of endometritis, though comparatively frequent, rarely lead to abortion or any special alteration of the fetal membranes; but the inflammatory process is certainly not relieved by pregnancy.

In rare cases it has been possible to demonstrate intercellular diplococci or bacteria in the fetal membranes. At the same time numerous foci of round-celled infiltrations surrounded by extensive hemorrhages were found in the decidua vera. The products of inflammation were also seen in the decidua serotina near the surface, in the form of aggregations of round-celled infiltration with a central necrotic area.

Another variety of fetal disease due to *endometritis catarrhalis deciduæ veræ* is known symptomatically as

(2) **Hydrorrhœa uteri gravidi,** and in this simple form rarely leads to abortion. As a result of hypersecretion of the hypertrophied and hyperplastic glands the decidua reflexa separates from the decidua vera and the secretion, which may exceed 3 fl. oz. (100 gm.) at each evacuation, is discharged from the internal os by uterine contractions resembling labor-pains. It is distinguished from the amniotic fluid by the fact that it is not followed by premature birth and does not contain either vernix caseosa or lanugo hairs. From urine it is distinguished by the fact that it contains no urea or only very minute quantities, that it is neutral or alkaline in reaction, and, finally, by the fact that it evidently emanates directly from the

uterus. It is distinguished from the secretion of a simple cervical endometritis and colpitis by the fact that the latter is very much less in quantity and contains pus-corpuscles and fungi, whereas the secretion of hydrorrhea uteri gravidi is of a watery and glairy nature (rarely containing a small amount of blood or pus when combined with cervical endometritis), free from albumin, contains a large percentage of NaCl, carries a number of epithelial elements along with it, and has a specific gravity of 1003.

The secretion collects between the two deciduæ, or, owing to the permeability of the fetal membranes for amniotic fluid, may be found between the decidua reflexa and the chorion, or between the latter and the amnion. If the secretion is retained within the gland-spaces the condition is known as *endometritis decidualis cystica* (Fig. 90); if the inflamed and hyperplastic mucosa undergoes proliferation a third pathological condition of the ovum is produced, known as

(3) **Decidua Polyposa.**—Proliferation of the stroma and of the cellular elements progresses *pari passu*, and leads to the formation of polypoid excrescences consisting of fibrous tissue harboring large deciduous cells, which induce circulatory disturbances in the form of engorgement of individual dilated vessels and of the cavernous blood spaces (see Fig. 90, No. 12). Later copious extravasations form, of which the polypoid excrescences ultimately appear to consist.

On the other hand, there may be a defective formation of decidua vera, an atrophy, in other words, cell proliferation being absent and the newly formed cells undergoing fatty degeneration. The atrophic decidua is smooth.

Myxoma chorii multiplex is a nutritive disturbance of the chorionic villi, which in some cases appears to originate in the decidual elements—formerly it was attributed exclusively to the fetal tissues of the chorionic villi—this condition leads to the formation of

(4) **Hydatid moles** (Fig. 89).

The histological changes consist in proliferation of the syncytium and secretion of mucus in the connective tissue of the villi, which become edematous and undergo myxomatous change. The connective tissue with its contained vessels eventually degenerates. Sometimes Langhans' layer proliferates. During the later months the decidua is destroyed, and in malignant cases the proliferated syncytium invades the muscular layer and the blood-vessels of the uterus.

The condition may also be due to local inflammations of the endometrium or perhaps to infectious diseases on the part of the mother, or to disease of the ovum derived from the father; abortion usually results. Sometimes the mole remains either wholly or in part within the uterine wall after expulsion of the ovum, undergoes further development, and takes the form of destructive myxoma, reaching the pampiniform plexus and sending metastatic emboli as far as the pulmonary artery. In other words, these hydatid moles behave like malignant tumors.

Infective emboli from a hydatid mole retained *in utero*, as, for instance, the malignant bleeding nodules in the vagina in Schauta's case, are very rare, but their recognition is of great importance. In the case mentioned, the attending physician had treated the patient for varix. In some cases the nature of the mole itself indicates the prognosis: the more the syncytium between the individual cysts is degenerated the better the outlook, and the stronger the proliferation, the more malignant the process.

The destructive process begins in the syncytium and the proliferation is, therefore, to be regarded as an *epithelioma of the chorion* (Marchand). There is a group of cases, however, which present a sarcomatous character, and these should be designated as *malignant deciduomata* (Sänger) or as *sarcoma deciduocellulare*, depending on the preponderance of the chorionic or of the decidual tissues.

Accordingly, active *therapeutic measures* are indicated. Abortion should be induced as rapidly as possible by exciting and keeping up the labor-pains, whether there is any hemorrhage or not—by tamponage, dilatation of the cervix, evacuation of the uterus with the hand or with a blunt curette. The latter requires caution on account of the friable condition of the walls.

The *diagnosis* is based on the appearance of a thin bloody discharge in the first months, and on the appearance, toward the middle of pregnancy, of uterine contractions and frequent hemorrhages. On examination the uterus is found to be undergoing rapid growth while remaining unusually soft, and without the appearance of any fetal parts during the second half of pregnancy.

Once abortion has begun, the appearance of the characteristic cysts (Fig. 89) is an indication to effect the complete evacuation of the uterine cavity.

After the abortion has terminated the patient must continue under medical supervision for months. Repeated irregular and copious hemorrhages point to a malignant character of the hydatid mole. In such a case the uterus should be curetted for the purpose of examination, and if the result is positive, immediate extirpation of the uterus is indicated, but without any further curettage. The tissue consists of a mixture of structureless syncytium containing large nuclei, giant-cells, and insular accumulations of smaller, less intensely staining ectodermal cells derived from Langhans' layer.

Just as the myxoma may involve only a part of the placenta, so we may have a general or circumscribed gelatinous hyperplasia of the umbilical cord, resulting in the so-called edematous form of hydatid. Sometimes the increase in the amniotic fluid leads to another anomaly of the ovum, known as

(5) **Polyhydramnion**, which does not in itself cause abortion, but may interrupt pregnancy, especially a double pregnancy, between the fifth and seventh months.

Hydramnion is observed particularly in multiparæ and with chronic diseases of the mother (syphilis, chronic anemia and relaxed condition of the system, leukemia and diabetes), but cannot in every case be referred to any definite symptoms of the mother, placenta, or child, although it may occur in combination with such symptoms. Sometimes the process runs an acute course and threatens the life of the fetus. Acute onset has been observed after traumatism.

In most cases polyhydramnion goes hand-in-hand with diseases of the fetus, such as edema, ascites, and anasarca in syphilis, and in hydrocephalic or transudative processes the result of venous stasis, resulting either in hypersecretion of the kidneys or in stasis of the umbilical veins and transudation through the amniotic lymphatic system into the amniotic sac. Hence hydramnion may be due to velamentous insertion of the cord, and sometimes may accompany ectopic gestation. Finally, it may be produced by inflammatory processes in the fetus (syphilis in a few cases certainly), directly as an inflammatory exudate, indirectly as the result of stasis due to cirrhosis of the liver, phlebitis, and so on. The presence of a lymphagogue substance has been experimentally proven in a diseased ovum (Opitz). The author has seen two cases of twin pregnancy with acute hydramnion in which the fathers suffered with latent gonorrhea and infected their young wives; later epididymitis developed, and although the microscopical examination of the semen showed it to be apparently healthy, the marriages continued sterile. The women showed no further pathological changes.

Owing to the unequal division of the placental vascular system in twins (Schatz), the nutrition is unequal, and the resistance to the current varies in the so-called third placental circulation which unites the two others. Hence poly- and oligohydramnion (Fig. 100), and in triplets, for instance, hydramnion of two amniotic sacs may occur.

The *diagnosis* finds some assistance in the marked spherical shape of the uterus with unusual distention of the abdomen (see Fig. 127, showing excessive distention of the abdomen in the fifth month of pregnancy), out of all proportion to the duration of pregnancy, so that often as early as the fifth or sixth month the pressure may interfere with respiration. The fetal parts are difficult to palpate, especially as the fetus is usually underdeveloped. It is a remarkable fact that in spite of the tension in the uterine cavity the presenting portion of the amniotic sac is relaxed.

Treatment.—If the subjective symptoms become very marked and dyspnea sets in, puncture of the amniotic sac through the internal os is indicated—never through the abdominal walls. This procedure may be repeated, and is not by any means always followed by premature delivery. In some cases nature herself brings about relief in this way.

Inflammations affecting all the structural parts of the placenta may be diffuse or circumscribed.

(6) This **inflammation of the placenta** evidently derives its origin from infectious germs of various kinds, the development of which is exceedingly slow. Syphilis undoubtedly plays a part in the etiology, although it may not be possible to demonstrate it in every case. The condition known as eclampsia, which manifests itself in clonic convulsions attended with loss of consciousness, leads to analogous changes in the placenta, especially to the so-called placental infarcts which occur very frequently, but cannot in any sense be regarded as pathognomonic of eclampsia. A placental infarct consists in subamniotic necrotic foci which, on account of their lamellar structure, have been designated "subamniotic fibrin." They often occur in combination with subamniotic serous or sanguineous cysts.

Syphilis leads to inflammatory proliferation of the stroma and protoplasmic covering of the villi, with thickening of the walls of the blood-vessels contained in them and in the umbilical cord, which eventually becomes obliterated.

These conditions tend to interfere with the circulation of the fetus by necrotic separation of large portions of the placenta, by the formation of individual thrombi in the

FIG. 93. **Syphilitic Inflammatory Villi;** marked proliferation of the connective-tissue and round-cell infiltration (5), especially in the neighborhood of the thickened blood-vessels (1). A few of the villi have lost their protoplasmic investment and are in process of conversion into intervillous thrombi (3); 6, normal protoplasm containing nuclei (cf. in this respect my remarks on Fig. 16); 7, villous blood-vessels—healthy, belonging to the fetus—(original microscopical drawing).

FIG. 94. **Transverse Section of a Syphilitic Umbilical Cord with Inflammation of the Media and Adventitia.**—Round-cell infiltration containing a central focus of softening (3); the other thickened artery (2) shows the characteristic triangular stellate form of the intima, the thick elastic fibers of the media, and the broad adventitia. The vein (1) has thin walls and gapes widely. The stroma is formed by normal myxomatous connective tissue (4). Externally the umbilical cord is invested with amnion, that is to say, with a layer of cuboidal cells, 5 (original microscopical drawing).

FIG. 95. **Microscopical Image of a "Placental Infarct"** (original drawing after a series of the author's own preparation, representing the histological development of such foci): 1, decidua papillæ in the chorionic placenta; 2, a robust connective-tissue villus in the decidual tissue conveying fetal blood-vessels; 3, normal villi containing fetal blood-vessels within the intervillous spaces, normally filled with maternal blood; here we plainly see the protoplasmic covering with nuclei scattered through it; 4, decidual cells separated from each other by exudation and undergoing necrosis; 5, necrotic villi lying in degenerated decidual papillæ, which have become converted into laminated masses of fibrous tissue (these layers [6] are the result of the varying pressure of the uterus on the ovum); 7, degenerated chorionic villi still retaining a trace of nuclear stain in the nuclei of the spindle-cells fused together by homogeneous masses of cell débris, formed by the fusion of the necrotic nucleated protoplasmic covering of the villi with secondary intervillous thrombi; 8, the necrotic cellular débris is undergoing organization; 9, a broad zone of connective tissue rich in cells is then formed; 10, fibrinous intervillous thrombus; 11, intervillous thrombus which has not yet undergone coagulation; 12, villus in the first stage of necrobiotic homogeneous coloration of the protoplasmic covering. The connective-tissue stroma of the villus is intact; 13, villus in the second stage of degeneration; the covering is changed to a feebly staining, homogeneous, granular mass of débris, which becomes fused with that of the adjoining villus; the walls of the blood-vessels are thickened in places where the stroma of the villi begins to degenerate; 14, calcareous deposits; 15, minute cysts within the berry-like proliferations of the protoplasmic covering (16), which at this point is peculiarly rich in cells; 17, deposits of calcified material within these cysts.

maternal blood spaces, or by diminution of the fetal pla-

Tab. 42.

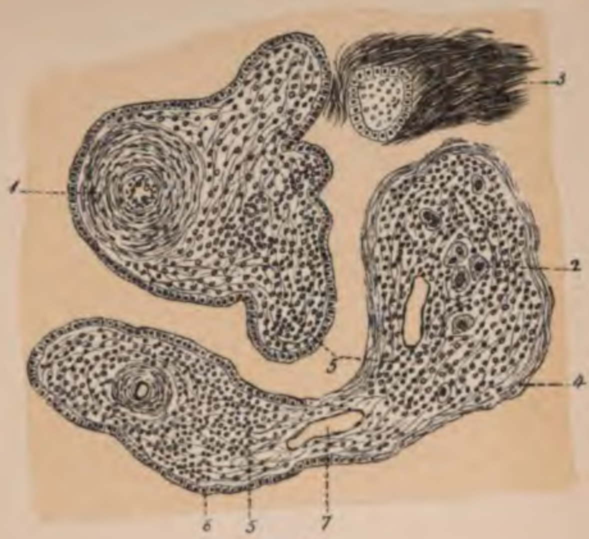

Fig. 93.

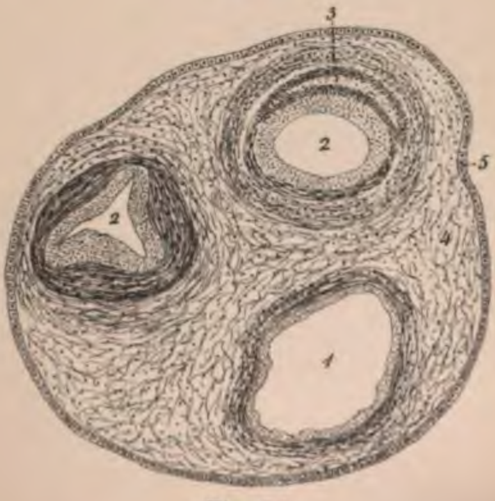

Fig. 94.

Lith. Anst. E. F.

Tab. 43.

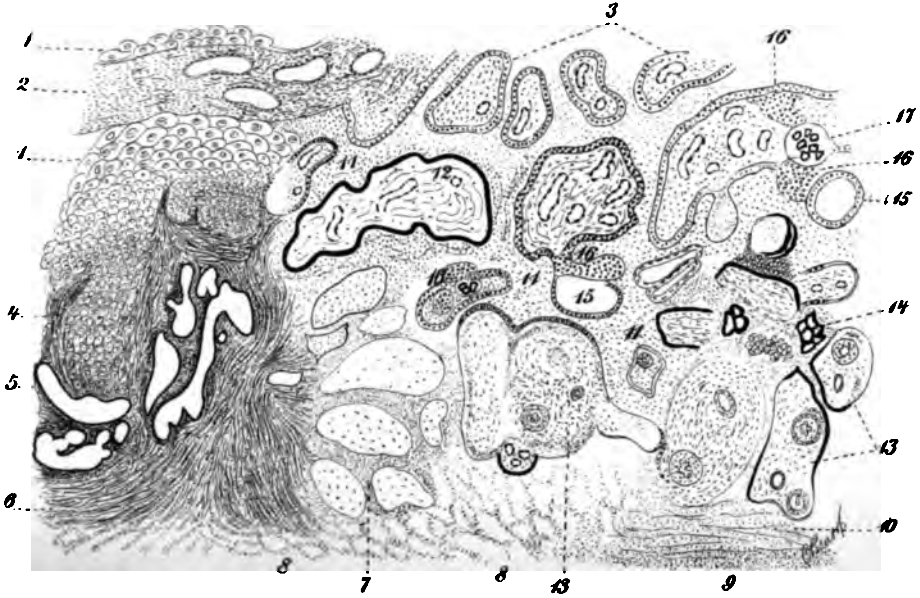

Fig. 25

FIG. 96. **Placental Infarct in Eclampsia**, consisting in subamniotic necrotic foci (original water-color drawing after the author's own preparation from the Heidelberg Gynecological Clinic; marginal insertion of the cord).

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in maternal infection, and, furthermore, the germ may pass from the infected ovum to the healthy mother, but such a mode of transmission to the mother is rare (*choc en retour*), evidently because the fetal specific toxins tend to render the mother immune, and she, therefore, usually does not, as a rule, become "retro-infected" (Colles's law).

Treatment.—Sodium iodide, gr. iiss to iv to xv (0.15 to 0.25 to 1 gm.) per day; calomel, gr. $\frac{3}{4}$ to iss to iij (0.05 to 0.1 to 0.2 gm.), three times a day, occasionally as a laxative and also for the purpose of mercurialization; Unna's mercurial plaster mulls instead of inunctions, and colloidal mercury. A syphilitic infant, or an infant born of syphilitic parents, although apparently healthy, must never be given to a nurse; neither should a healthy mother nurse a diseased infant. The infant should be bathed in sublimate baths (1 gm. in 20 quarts [liters] of water) and should receive calomel, gr. $\frac{1}{12}$ to $\frac{1}{8}$ (0.005 to 0.0075 gm.), and Dover's powder, gr. $\frac{1}{24}$ to $\frac{1}{12}$ (0.003 to 0.005 gm.), three times a day. As regards the physician's consent to marriage, it should be given only when five years have elapsed from the time of infection and three years from the last manifestation of the disease. Immediately before marriage the patient should be subjected to an inunction cure. The individual should always be cautioned about the danger of infection from erosions on the genitalia and on the mouth.

§ 13. ECLAMPSIA GRAVIDARUM.

Whether eclampsia gravidarum (rarely, puerperarum) is an infectious disease or not is still an open question. That it owes its origin to a specific contagium has never been proved and does not appear probable. It is possible that compression of the ureters (directly or indirectly as a result of stasis in the vascular or lymphatic circulation)

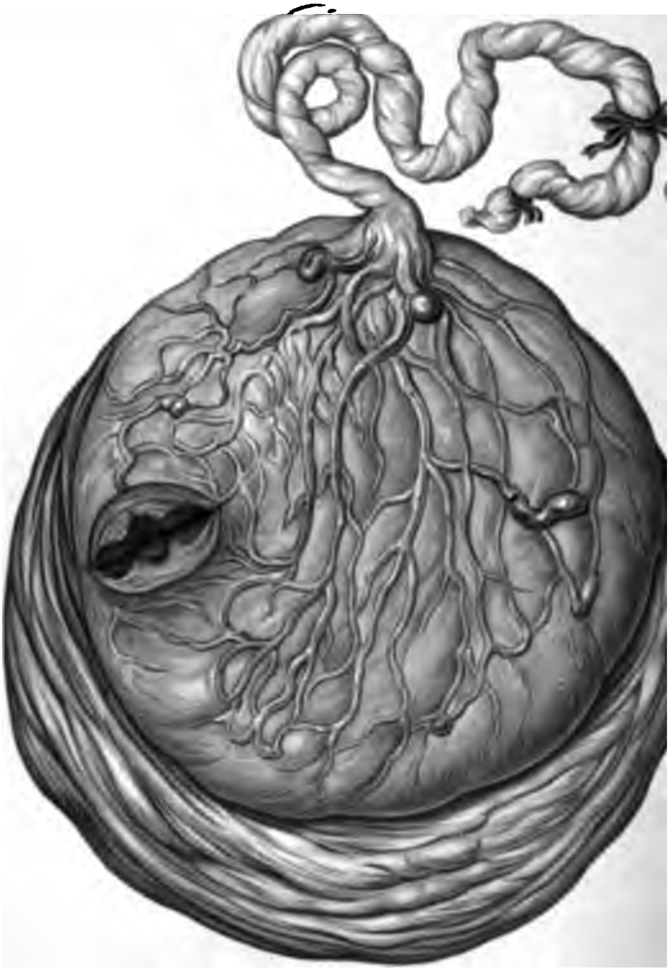

Fig. [illegible]

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by the entrance of the child's head into the true pelvis is followed by secondary interference with the renal secretion, and that this in turn leads to retention within the blood of various kinds of micro-organisms and especially of their toxins, or, in other words, ptomains, the presence of which may produce toxic metabolic products in the various organs of the body (leucomains). The explanation which appears to be most probable is that toxins, especially insufficiently oxidized products of metabolism, are retained as a result of insufficiency of the liver and kidneys in individuals whose organisms, owing to their neuropathic habit, fails to adapt itself both in the matter of circulation and of internal metabolism to the changes in these functions incident to pregnancy.

If the hepatic and renal insufficiency and the retention of metabolic toxins (leucomains) reach a high degree toward the end of pregnancy, the nervous impulses attending the act of respiration give rise to abnormal reflexes of the intoxicated nervous system (clonic convulsions) and to disturbances in the circulation. In this way we may explain the acetone and sugar found in the urine by Stumpf, as well as the amyloid and fatty degeneration of the kidneys, liver, brain, etc., attended with thrombosis and apoplexy or with edema and anemia in these organs. Thus, for instance, acetonuria can be produced experimentally by excluding the celiac ganglion of the sympathetic nerve.

There is no doubt that pressure conditions and irritative processes in the pelvis, involving the sympathetic ganglion and the ureters, play an important and very frequent part in the etiology. Hence, the first pregnancy—on account of the early descent of the head—double and triple pregnancies, and generally contracted pelves are counted among the predisposing causes. Flat or anteroposteriorly contracted pelves do not produce the condition because the deeply excavated "dead space" (from an obstetrical point of view) alongside of the projecting promontory protects the ureters and blood-vessels. There is no single

FIG. 97. **Uterus Bicornis Septus.**—Child in first face presentation: chin posterior, the contractions of the uterus having forced the axis of the child's body obliquely against the opposite walls of the pelvis. $C.^1C.^2$, the two cornua of the uterus: *C.R.*, contraction-ring.

FIG. 98. **Uterus Introrsum Arcuatus.**—Oblique position Ia with shoulder presenting. The depression in the fundus is very marked; it could not be palpated in the foregoing case. Lettering as in Fig. 97.

FIG. 99. **Pendulous Abdomen of the Third Degree.**—Sagittal section showing the position of the child and the vaginal portion of the cervix. The fundus of the uterus is lower than the vaginal portion of the cervix (original drawing).

cause, or, to be more exact, there may be a single cause, but there is no single exciting cause, to account for the outbreak of the symptom-complex which is known as eclampsia. The usual time of appearance is during the last three months of pregnancy. In isolated cases there is no nephritis.

The *symptoms* consist in attacks of clonic convulsions, beginning at the head and extending downward. The severe headache with debility and oppression observed before the attack is replaced by unconsciousness; the face becomes cyanotic, the pulse small and rapid, respiration accelerated, sighing or blowing, and accompanied with diaphragmatic spasm. The facial and ocular muscles are also involved in the convulsions.

The attack, which lasts from one-half to one and one-half minutes, is followed by a condition of coma with a rise of temperature and acceleration of the heart-beat. The face becomes pale and pulmonary edema is very apt to develop.

The urine always contains albumin, fibrinous casts (also red and white blood-corpuscles), sugar, acetone; the amount is very much diminished and the acidity greatly increased. Experiments with the urine and blood indicate that they are extremely toxic and contain large masses of leucomains.

Among the prodromal symptoms and consequences of an attack may be mentioned headache with nausea and vertigo, amblyopia and amaurotic symptoms, pneumonia,

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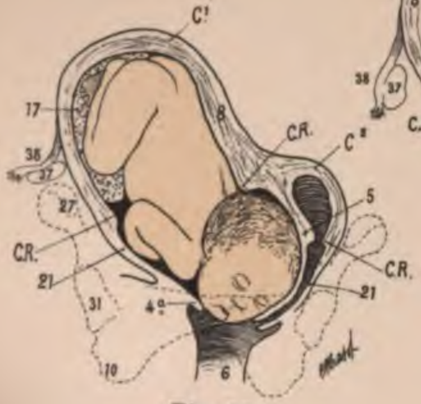

Fig. 97.

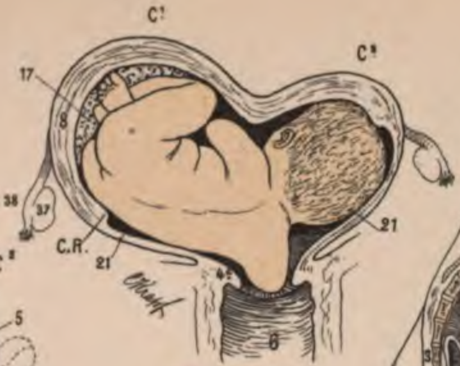

Fig. 98.

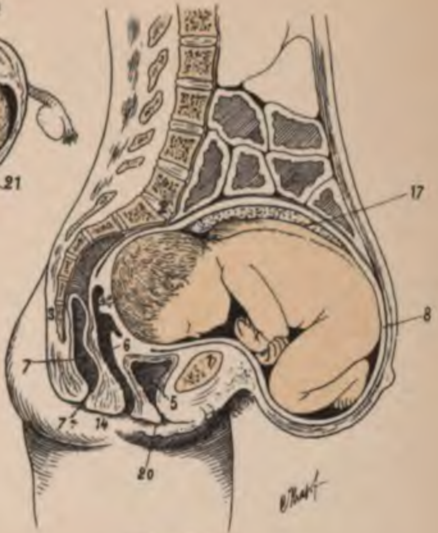

Fig. 99.

Lith. Anst F. Reichhold, München.

loss of memory for past events, maniacal conditions temporary in character and preceded by fits of taciturnity, alternating with garrulity, laughter, etc. Oliguria or anuria are frequent prodromal symptoms.

The consequence to the fetus is death, either at the time of birth, which is usually premature, or during pregnancy, without, in the latter case, the death of the fetus being necessarily followed by delivery, although the attacks cease with the death of the child. Sometimes children are delivered in a condition of rigidity, and, on the other hand, eclampsia neonatorum has been observed without any eclamptic symptoms on the part of the mother, who, however, suffered from nephritis. Finally, there may be changes in the tissues of the placenta such as have been described above. After delivery the attacks usually cease, but they may be readily provoked by massage of the uterus or the expression of the placenta by Credé's method.

The *treatment* consists in administering enemata of chloral hydrate, gr. xv to xxx (1 to 2 gm.), after every attack; ʒiij to iv (12 to 15 gm.) per day (v. Winckel), or subcutaneous injections of morphine as high as gr. ss (0.03 gm.) at each attack (G. Veit has given as high as gr. iij [0.2 gm.] in four to seven hours); and, finally, in administering chloroform, but only for a short time and provided the pulse is full and of good tension. Subcutaneous injections of decinormal salt solution. Prolonged immersion in a bath of from 97° to 104° F. (36.2° to 40° C.) or an equivalent warm pack for the purpose of inducing diaphoresis is to be recommended. Delivery is to be effected as soon as possible, that is, as soon as it can be done without danger to the mother, either by dilating or incising the os. The patient is to be watched constantly, and a piece of wood or a spoon or other object covered with cloth must be inserted into her mouth to prevent injury to the tongue. Every unnecessary disturbance is to be avoided. Great care must be exercised in giving liquids, as inhalation-pneumonia might result.

Prophylaxis includes the treatment of the nephritis, the regulation of the bowels, the induction of diaphoresis, and a milk diet.

§ 14. THE RELATIONS BETWEEN PREGNANCY AND DISEASES OF OTHER ORGANS.

As has been mentioned, general febrile **infectious diseases** frequently lead to abortion, either by setting up a local endometritis and decidual hemorrhages, or by favoring the accumulation of heat and the transmission of toxins, or, more rarely, of bacteria themselves. In *typhoid fever* most patients who recover abort. In *variola* they recover without abortion, the children being immunized *in utero* and born with pockmarks, but if abortion takes place most patients die. In *cholera* recovery and death occur indifferently with or without abortion.

Vaccination of the pregnant mother does not, as a rule, render the child immune.

Influenza, according to my observations, leads to pelvic congestion and abortion or, more rarely, to premature labor, depending on the severity of the epidemic. Abortion is less rapid, but often associated with more copious hemorrhage. The placenta is unusually soft; the subsequent discharges are often fetid. The usual nervous phenomena of influenza are present and occasionally alternate with maniacal conditions.

The occurrence of *erysipelas* during pregnancy is a serious complication on account of the great danger of septic infection during delivery. Cases of septic infection of the mother during pregnancy almost always result in death of the fetus. Streptococci, staphylococci, and the bacterium coli have been found in the blood of such fetuses. *Tetanus* has been observed in a few cases, usually after an operation. The uterus does not take part in the muscular contractions. Although the poison passes through the placenta and causes the death of the fetus it does not produce abortion directly.

Scarlatina runs the same course as in non-pregnant women. There is a pseudoscarlatinal eruption which manifests itself as a special form of septic infection during the puerperium. In *morbilli* fetuses have repeatedly been born with the eruption of measles in various stages, and the eruptive stage can be recognized by the increase in fetal movements.

Impetigo herpetiformis gravidarum is a somewhat rare infectious disease of very grave prognosis, for which reason it is important to be able to recognize it. It appears in the form of vesicles and pustules in the genital region and later spreads to the abdomen and to the neck; it also attacks the mucous membrane of the intestinal tract and leads to hemorrhages from the bowel. The disease often results in abortion and frequently in death. Timely induction of premature labor is indicated, as the disease usually does not appear before the middle of pregnancy.

Otherwise there is no indication to induce artificial abortion.

I also agree with Fritsch in laying it down as a maxim that the induction of premature labor is not indicated in cardiac disease (digitalis and ether should be employed) nor in diseases of the lungs.

Before deciding that the induction of labor, or, rather, the termination of pregnancy, is necessary and more advantageous to the woman than delivery at term, we must have special reasons based on the individual peculiarity and the merits of each particular case. Such indications are found in the literature and in the *symptomatology* of cardiac diseases complicating pregnancy.

If there is perfect compensation pregnancy runs a favorable course if the woman lives a rational life. If compensation fails the condition usually remedies itself by a spontaneous abortion. If the latter does not occur it is often possible, by bringing about compensation (digitalis except in aortic insufficiency, ether, or venesection), to bring the pregnancy to a successful termination. If com-

FIG. 100. **Twisting of the Umbilical Cord and Oligohydramnion of a Dead Twin.**—The torsion is greatest at the navel. This fetus was restricted to a very small nutritive area on the placenta. The cord of the other living twin (lodged in the polyhydramniotic sac) presents elongated arteries with circumscribed accumulations of Wharton's jelly, so-called "false knots" (original drawing from a preparation in the Munich Gynecological Clinic).

FIG. 101. **Placental Infarcts,** wedge-shaped, penetrating deep into the choriodecidual tissue, from a case of eclampsia (original drawing after a preparation from the Munich Gynecological Clinic).

pensation cannot be effected the successful result of artificial removal of the ovum will depend on the promptness with which the ovum is expelled and on the duration of the pregnancy; in other words, on the amount of exertion necessary to expel the ovum and, of course, on the severity of the disease itself. Labor-pains and the changes in blood-pressure which they produce are far more dangerous than the alterations in the circulation during pregnancy, and we know that a premature delivery lasts longer than delivery at term. The best method in such cases consists in puncture of the sac, because the woman is immediately relieved of her burden. Rational indication for the artificial induction of premature labor exists, therefore, in those cases in which the cardiac action is endangered less by the momentary shock of expulsion than by the duration of the circulatory embarrassment, especially in aortic valvular disease.

The mortality given by clinicians, from 30 to 60 per cent. (average 40 per cent. in two hundred and fifty cases), is too high; while, on the other hand, the mortality of 6 per cent., which was obtained in Gusserow's obstetrical clinic, is too low for the conditions met with in private practice; from 10 to 15 per cent. probably represents the true figure, depending on whether the woman has previously been under the care of a physician or not, as diet and proper treatment exert a marked influence on the cardiac condition.

In the case of hard-working women the prognosis should be more guarded than in the case of those who

Tab. 46.

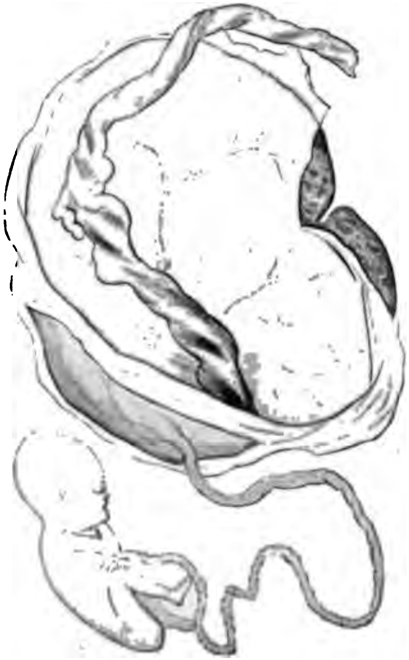

Fig. 100

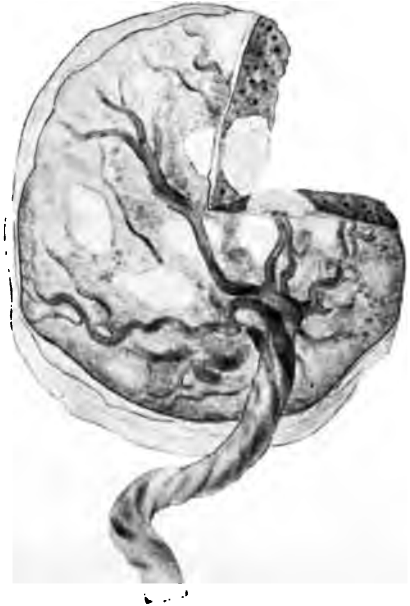

Fig. 101

are able to spare themselves and live a rational life. If the lesion is acquired in early youth the prognosis is also less favorable. It is also affected by the age of the patient, the number of previous pregnancies, and the consequent using up of cardiac force. For this reason the condition of the heart-muscle is quite as important as the particular variety of valvular lesion. Myocarditis and degeneration of the heart-muscle influence the prognosis very unfavorably. The induction of abortion is positively indicated before the fourth month if these conditions are present. In the operation of inducing abortion it must not be forgotten that the resisting power of the mucous membranes is much reduced by the existing local disturbance of the circulation and that they are, therefore, particularly liable to infection. Cardiac shock and postpartum hemorrhages are best treated by the application of a sand-bag to the lower part of the abdomen (perhaps the inhalation of amyl nitrite or, better, ether, but ergotin should never be given). The patient's relatives should have the desperate nature of the case fully explained to them beforehand. Complication with renal affection must not be disregarded, as the consequent retention of toxins adds another burden to the work of the heart. The same is true of gastric, intestinal, and hepatic insufficiency.

The physician may give his consent to marriage except in cases of debilitated and very anemic and neurasthenic individuals, or when the heart-lesion has been acquired early in life and when there is degeneration of the heart-muscle and marked failure of compensation, especially if there is reason to expect that the woman will have to lead a hard life.

In **lung diseases** (croupous pneumonia and especially phthisis) the course of the pregnancy itself is usually favorable; on the other hand, the act of parturition is apt to give rise to grave disturbances on account of the loss of blood, the muscular exertion, and the imminent danger of cardiac insufficiency and consequent pulmonary edema. The rule is to be emphasized that premature labor is not to be induced artificially, but as soon as labor has begun it should be terminated as rapidly and with as little distress to the patient as possible.

The passage of tubercle bacilli through the uninjured placenta to the fetus, although very difficult, has been demonstrated in a few cases, both bacteriologically and clinically.

Finally, it should be mentioned that there are cases of hemoptysis during pregnancy which have nothing to do either with tuberculosis or with nephritis.

There is a group of diseases which present the most intimate relation with pregnancy: they are the **disturbances of metabolism** and **nervous diseases.**

Their symptoms depend on toxic effects, due either to the formation of abnormal metabolic products or to the retention of such products; in other words, on auto-intoxication in its widest sense. In chronic metallic intoxications, such as lead-poisoning, abortion is frequent; the woman should not be allowed to nurse her child, as the milk contains lead.

The theory that hysteroneurasthenic conditions and functional neuroses following an auto-intoxication are due to imperfect oxidation in internal metabolism is constantly gaining ground, and finds more and more support in the results of experimental and pathological chemical investigations. It is well known that an albuminuria may follow violent exertion, that the blood as well as the urine of neurasthenic patients contains metabolic products, both qualitatively and quantitatively abnormal (uric acid, phosphates, albumin, urobilin, leucin, xanthin, hypoxanthin, indican, levulose, etc.), and that in the pregnant organism certain substances are formed and can be demonstrated in the urine, which are capable of producing convulsions and may lead to albuminuria and the typical picture of the "kidney of pregnancy." It is true, moreover, that as a result of this relative or absolute auto-intoxication the reflex irritability in the central nervous system is greatly increased, owing to the anemia which results from the congestion in the abdominal walls (vomiting of pregnancy), and that in neuropathic pregnant women the already existing anomalies of the internal metabolism, including those of the thyroid gland, become accentuated and easily lead to renal and hepatic insufficiency. The reflexes are, therefore, markedly increased, especially if the woman is the subject of a reflex neurosis (hyperemesis gravidarum, ptyalism, tussis uterina, diarrhea gravidarum, eclampsia, icterus gravidarum).

In various intoxications due to metals, bacterial toxins, and toxic metabolic products, including peptotoxins of gastric origin with pernicious anemia, the nutrition of the motor cells in the anterior horns is usually found to be affected earlier than that of the posterior columns, the inverse order being very rare.

Examination of the urine of eclamptic patients reveals large quantities of leucomains. We also find in the urine of women suffering from hyperemesis the following substances: large quantities of urobilin, which may be derived either from hemoglobin or from bilirubin, that is to say, either from the decomposition of blood or from hepatic disease; acetone; peptone usually; increased amount of oxalic acid; skatoxyl; indoxyl; a large amount of urinary sediment; hyaline and granular casts frequently; occasionally blood-corpuscles, fatty epithelium, triple phosphates, sodium urates, and oxalates of calcium. These findings show a marked resemblance to the condition of the urine found in infectious diseases, or, in other words, in intoxications by toxins formed within the body.

Hyperemesis is to be regarded as an exaggerated reflex neurosis due to an auto-intoxication, based on a general neuropathic habit or in some cases undoubtedly on simple hysteria. For practical purposes it is important to distinguish three stages: the patient may vomit immediately after taking food and be able to retain a little; the patient may vomit from an empty stomach and suffer from constant nausea, so that she can take very small amounts not only of solid but also of liquid food; and, finally, the patient may suffer from constant retching, going on to hematemesis, with insomnia and fever, and become very much debilitated; attacks of syncope, icterus, and death may follow.

The *treatment* is based on the etiology. It should be directed chiefly toward overcoming the hysteroneurasthenic abulia (loss of will power); the ingestion of food or medicaments by the mouth should be abandoned; enemata of decinormal salt solutions and diaphoretic remedies should be given to stimulate elimination of toxins through the skin (wet packs); and, finally, if even the administration of an enema provokes the vomiting reflex, hypodermic injection of salt solution is indicated. As the patient improves she should be made to take large quantities of milk and then be put on a gradually increasing strengthening diet, the bowels being regulated by means of enemata and hydrotherapy. Treatment in an institution under strict control will prove most efficacious of all. The question of inducing abortion rarely needs to be considered, but if it is to be done at all it should not be put off too long, as cases have been reported in which the patient succumbed, after spontaneous or artificial abortion, to the complete insufficiency of all the organs.

In a number of cases the primary cause is to be found in anomalies of the genital organs in connection with the same neurotic diathesis. Retroflexion of an incarcerated uterus; spastic conditions of the retro- or anteflected uterus with descent of the body; hydramnion; hydatid mole; decomposition of a hematoma retained *in utero*, twin pregnancy. According to the condition present, relief is obtained by the induction of abortion, puncture of the amniotic sac, freeing the pole of the ovum by dilating the cervix without necessarily bringing on abortion (Copeman's procedure). Occasionally manipulations of this kind act by suggestion in hysterical women. Mild grades of hyperemesis, especially such as depend on a true local dyspeptic trouble, are successfully treated with basic orexine (Frommell), gr. v to viij (0.3 to 0.5 gm.), in capsules, two or three times a day.

Ptyalism also occasionally occurs and runs a course with similar alarming symptoms. Diaphoresis and diuresis should be stimulated by hydrotherapeutic measures (juniper berry, if there is no nephritis) and the bowels moved regularly. In regard to drugs, I have seen good results follow the administration of atropine or of agaricin, unless, as is often the case, hyperemesis exists; potassium bromide is of no value. I once used agaricin in a case in which ptyalism, protracted attacks of violent hyperidrosis, diarrhea, and reflex vomiting alternated at various times and at various pregnancies in the same woman. I have noticed this variety of nervous diarrhea in pregnant women whose urine contains large quantities of uric acid at various times and who inherit the neuropathic and gouty diathesis. Temporary relief was obtained in such cases by bismuth and opium powder, tincture of thebaine, proper dieting, and diaphoretic measures.

Tussis uterina is undoubtedly a reflex neurosis in many cases and is, therefore, to be treated both locally and constitutionally with tonics and sedatives. Narcotics must, however, be avoided.

Icterus gravidarum is usually a symptom of hepatic insufficiency associated with hyperemesis, and occasionally goes on to an acute yellow atrophy, which is not due to infection, but to intoxication, and may give rise to attacks of eclampsia. In a few cases it leads to habitual abortion.

Diabetic symptoms, including pruritus vulvæ, are aggravated by pregnancy in three-fourths of all the cases. The fetus is born under weight and greatly debilitated or dies in the second half of pregnancy with or without polyhydramnion. The presence of slight glycosuria toward the end of pregnancy is physiological. The induction of abortion depends on the possibility of checking the sugar excretion and the rapid deterioration of the entire organism. Otherwise the usual régime is to be instituted, which, indeed, according to Kleinwächter's extensive studies, is to be preferred in the great majority of cases. Diabetic girls should not marry.

The prognosis in *primary grave anemia of pregnancy* is very bad; most of the authorities are against the induction of abortion. Some cases are reported, however, which have been cured in this way. In leukemia induction of abortion or premature labor is indicated.

Hemophilia, purpura hæmorrhagica, and *scorbutus* are very apt to cause abortion on account of the hemorrhages; abortion should never be induced artificially.

Basedow's disease is unfavorably influenced by pregnancy and not rarely leads to abortion.

Many forms of *neuritis* with hyperemesis which occur during pregnancy are evidently to be regarded as due to toxins acting especially on the corresponding portions of the spinal cord; thus we have in many cases symptoms of bulbar disease.

Hysteria is not influenced by pregnancy. *Epileptic* women appear to be improved in one-half of all the cases. *Psychoses* appearing in the first months of pregnancy usually disappear after the fourth month, although, strange to say, they not rarely reappear during the puerperium; the prognosis depends on heredity and not on the fact that the woman is pregnant. Melancholia is the most frequent manifestation. Maniacal symptoms may occasionally appear, but only secondarily. *Tetany* has been observed a few times during pregnancy after total or partial extirpation of the thyroid gland; in some cases it appears simultaneously with uterine contractions.

In *chorea* the prognosis is very grave, the mortality is 30 per cent., and premature labor occurs in 20 per cent. of all cases. Induction of abortion is indicated if the case is grave, the principal indication being insomnia. Chronic or acute *diseases of the spinal cord*, such as transverse myelitis, do not interfere with normal pregnancy and parturition, although there may be complete anesthesia.

Among **renal diseases** we distinguish, for practical purposes, the *kidney of pregnancy*, *chronic nephritis*, and *purulent pyelonephritis*. I have seen the latter twice after influenza in the fifth and seventh months respectively, and in spite of the gravity and long duration of the symptoms the cases ended in successful delivery, so that I was very glad that I had not advised my colleague who was in charge of the case to induce premature labor. The proper treatment is diaphoresis and, if necessary, nephrotomy. In very rare cases purulent pyelonephritis indicates an exacerbation of renal tuberculosis. Pregnancy and floating kidney do not appear to exert an unfavorable influence on each other unless hydronephrosis co-exists.

The term *kidney of pregnancy* is applied to certain changes of an originally healthy kidney due to mechanical influences, or to circulatory alterations, or to the influence of toxins. Albuminuria, gradually increasing oliguria, the appearance of large masses of fatty morphological elements, without red corpuscles but with a few leukocytes, and edema are the principal signs.

The *prognosis* is good unless eclampsia supervenes. In pregnant women who have undergone nephrectomy the prognosis is good so far as we know (Fritsch). The case is different with chronic nephritis. The morbid process increases in severity and there is great danger of retinitis albuminurica or of amaurosis without ophthalmoscopic lesions and with impaired pupillary reaction, and, occasionally, of amblyopia developing. The condition also leads to marked dropsy and to hemorrhages in various mucous membranes and even into the placenta. As a result of the latter the placenta may be detached either suddenly or gradually by sclerosis of the vessels and the formation of the placentar infarct (Fehling, cf. Figs. 95 and 96), leading to death of the fetus, which is frequently dropsical.

Treatment must be early and energetic and directed to the cure of the renal condition: milk diet, hypodermic injections of physiological salt solution, and diaphoresis (during eclampsia). If alarming symptoms develop and the patient's life is threatened, as by intense dropsy or retinitis, with vision less than one-sixth, premature labor must be induced with all proper precautions, so as, if possible, to deliver a viable child. In rare cases repeated attacks of hematuria of angioneurotic origin have been observed in simple hyperemia of the kidneys in which the prognosis was favorable. Intestinal hemorrhages have also been reported.

Traumatism during pregnancy may be divided into: (*a*) Accidental external injuries affecting the organs of gestation; (*b*) Operations, including as a special group operations on the organs of gestation themselves; (*c*) Criminal abortion performed without the necessary precautions and leading to coarse lesions of the organism; (*d*) Perforating peritonitis and rupture of the uterus or of an ectopic gestation-sac during, or subsequent to, pregnancy.

Group (*a*), or external injuries during pregnancy, includes (1) certain special accidents, such as laceration of the abdomen and gravid uterus by an angry cow or by the knife of the criminal;

in other words, a kind of Cesarean section has been frequently reported in the literature, and, in spite of the terrible mutilation, the accident did not by any means always result in death. The first Cesarean section in Germany was performed during the Middle Ages by a swineherd on his own wife, and, although his technique was most primitive, the result was favorable. Certain tribes of negroes perform the operation with an approach to antiseptic measures, such as the use of red-hot stone knives, washing the wound with the juice of some plant, and fumigation.

(2) Gunshot wounds of the abdomen, either penetrating the amniotic sac and the fetus, or those in which the bullet becomes arrested in the uterine wall and does not injure the ovum. The prognosis and treatment depend largely on whether or not the ovum has been injured, as I note by a careful examination of the cases collected by Neugebauer. In penetrating wounds the amniotic fluid is discharged into the peritoneal cavity and the omentum is swept into the wound, hence, infection being almost certain to occur, immediate laparotomy is indicated, as it is when the intestines are injured. After the uterus has been evacuated the lips of the uterine wound should be resected and sutured and a Mikulicz tampon inserted into the lower angle of the wound, so that, if necessary, a secondary supravaginal amputation can be performed in case the uterus becomes infected. After non-perforating wounds premature delivery usually occurs within a few weeks, although the fetus is generally alive. In such cases expectant treatment is indicated unless peritoneal symptoms develop.

External violence with a *blunt instrument*, such as a kick, a fall, or a blow, while it rarely leads to rupture of the uterus, is often followed by separation of the placenta with danger of death from internal hemorrhage, or the formation of a hematoma in the umbilical cord or fetal membranes by the rupture of large vessels in the placenta and in the cord. A common accident consists in falling astride of the arm of a chair or other object, leading to rupture of the engorged corpora cavernosa in the region of the clitoris and threatening the woman's life by hemorrhage. There is a specimen in the Munich Gynecological Clinic of a gravid uterus with twins which was taken from a woman who died of hemorrhage in this way a quarter of an hour after the accident. Other similar cases are found in the literature. Compression and ligation are the proper measures.

Group (*b*). *Urgent operations* are to be unhesitatingly performed during pregnancy. If the anesthesia is not protracted too long there is no danger to the fetus. It is always proper to perform an operation for the removal of tumors or other obstacles which would constitute absolute dystocia at the time of delivery. Carcinomata are always to be operated upon at once. Abortion is apt to be induced only by operations directly affecting the uterine wall, such as the enucleation of a subserous intramural myofibroma, or puncture through the abdominal walls for the evacuation of hydramnion, and operations on the intermediate and supravaginal portion of the cervix. Ovariotomy does not, as a rule, bring on abortion. The removal of adnexa or subserous polypoid myomata on one side is usually well borne. The same is true of plastic operations on the vagina. Even the operation for appendicitis is not contra-indicated by pregnancy. As perityphlitis not rarely leads to abortion or premature labor, this condition occupies a prominent place in the pathology of pregnancy and of the puerperium.

Nephrorrhaphy for the relief of a twisted kidney and local peritonitis, *nephrectomy* on account of suspected renal tumors, and *extirpation of the spleen* for traumatic rupture have been successfully performed. The abdominal scar becomes markedly pigmented during pregnancy, the pigmentation following the line of the scar and of the sutures (Fig. 160).

Group (*c*). *Criminal abortion* usually consists in the introduction of a sharp instrument for the purpose of rupturing the amniotic sac or bringing on labor-pains. If the instrument enters the posterior vaginal vault by mistake, or fails to follow the proper curve after entering the internal os, the peritoneal cavity is perforated. If aseptic precautions are neglected, septic infection develops and ends either in death or in lifelong invalidism.

Group (*d*). *Perforation Peritonitis.*—This is caused in most cases by necrotic pyosalpinx, or the rupture of a peritoneal abscess, or of a gangrenous bladder in retroflexion of an incarcerated gravid uterus during the fourth month of pregnancy. Death results unless laparotomy is immediately performed and iodoform gauze introduced into the lower angle of the wound for the purpose of drainage (see § 13).

Rupture of the uterus with discharge of the ovum into the peritoneal cavity was a fairly common accident in the days before antisepsis, when the uterine wound was not sutured after Cesarean section; the accident usually ended in death. Now that the wound is carefully closed with a double row of silk sutures (if catgut is used, diminution in the thickness of the uterine wall sometimes occurs at the next pregnancy) the accident is rare. It also occurs in ectopic gestation in rudimentary cornua (see § 20 *a*; 15, 1).

Rupture of a tubal sac in ectopic gestation calls for removal of the ovum and blood-clots, either through the vagina or through the abdominal wall, on account of the profuse intraperitoneal hemorrhage and the danger of secondary peritonitis (see § 17).

A special group includes anomalies in the shape and position of the pelvic organs, especially of the genitalia, which may lead to abortion on account of the want of room or the primary and secondary disturbances of the circulation. But as abortion under such conditions is a comparatively rare occurrence we shall reserve its discussion for the chapter on disturbances of pregnancy in general, which result from those conditions.

§ 15. DISTURBANCES DURING PREGNANCY DUE TO ANOMALIES IN THE SHAPE AND POSITION OF THE GENITAL ORGANS, ESPECIALLY THE UTERUS.

1. **Malformations of the Uterus.**—*Uterus unicornis* is due to the arrest of development of one of Müller's ducts, as a result of which the uterus is imperfectly developed; the organ usually occupies an oblique position and is conical at the fundus. The marked attenuation of the walls often leads to rupture even during pregnancy. The *diagnosis* cannot be made with any certainty, even when there is another rudimentary, secondary horn, unless the presence of a septum in the vagina should arouse a suspicion of double uterus. There may be impregnation of the rudimentary horn which cannot be distinguished from extra-uterine pregnancy and gives rise to the same dangers, namely, rupture of the gestation-sac as early as the middle of pregnancy.

Uterus bicornis is due to independent development and imperfect union of the two ducts. The wider the separation between the ducts the more independent the functions of the two portions. Thus we observe separate labor-pains in uterus bicornis, and if both horns are gravid there may be a considerable interval between the births of the two fetuses.

The *diagnosis* of uterus bicornis is exceedingly difficult, as there is only one portio vaginalis.

Uterus didelphys (duplex), or the development of two entirely independent uteri with complete separation of the portio vaginalis and either a single or a double vagina, one of which may be imperforate. Even in *uterus septus* (bilocularis) regular menstruation and ovulation of one uterus may continue while the other is impregnated. Not rarely pregnancy alternates in the two uteri. Double pregnancy has also been observed; it gives rise to marked disturbances. At every parturition a decidua is expelled from the non-gravid side. The *diagnosis* is somewhat easier in the slighter, than in the more pronounced, anomalies, because in the former the entire common portion is occupied by the ovum and, therefore, the two horns can be recognized above it (Fig. 98), whereas in pronounced forms of the malformation the ovum is lodged in one side, the other side undergoing very little hypertrophy and being, therefore, difficult to palpate (Fig. 97). In this anomaly we occasionally meet with premature delivery and rarely with rupture of the single gravid horn during the second half of pregnancy, without the occurrence of labor-pains (case by Weil of Teplitz).

Toward the end of pregnancy the empty cornu may, if it is lodged in the pouch of Douglas, obstruct the superior strait like a tumor.

In abortions, especially if complicated with sepsis, the possibility of a double uterus and vagina must always be borne in mind.

Treatment.—In most cases the pregnancy runs a favorable course; but as a number of cases have been reported in which rupture occurred and was almost immediately followed by death, it is important, after such a malformation has been recognized, to determine, if possible, whether the position, fixation, and thickness of the walls of the gravid portion are such as to enable it to bring the ovum to maturity. A large number of careful observations from the very beginning of pregnancy are urgently needed to enable us to determine the expediency of inducing abortion in a concrete case. In any case pregnancy in a rudimentary horn is to be treated on the same principles as an extra-uterine pregnancy. If the abdomen is very much distended and tender to the touch, either of the palpating hand or of the fetal parts, if there

FIG. 102. **Retroflexion of a Gravid Uterus.**—Owing to severe ischuria and decomposition of the stagnating urine the entire vesical mucosa has undergone necrosis and separated from the wall of the bladder in the form of a complete sac (modified after Schatz).

FIG. 103. **Partial Retroflexion of a Gravid Uterus,** secondary to total incarceration.

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are great emaciation and insomnia, even without elevation of temperature, laparotomy is indicated. After septic abortion of one horn in double pregnancy the other horn is to be immediately evacuated.

2. **Displacements of the Uterus.**—Abortion is only relatively frequent in *incarceration of the retroflexed* gravid uterus. It constitutes a grave complication and is fortunately rare in comparison with the frequency of retroversion and retroflexion. The displacement is unfavorable to conception and favors abortion both mechanically, on account of the position of the uterus, and by the circulatory disturbances to which it gives rise.

Retroversion of the gravid uterus, that is, dislocation of the fundus backward over the transverse axis of the pelvis with the vaginal portion in front, without flexion of the body upon the cervix, may become converted into retroflexion if the impregnated body of the uterus during its growth descends *in toto* and becomes arrested under the promontory. If the fundus is under the promontory, but higher than the external os, we speak of the displacement as a *retroflexion of the first degree;* if the fundus is at the level of the portio vaginalis, it is a *retroflexion of the second degree*; if still lower, it is a *retroflexion of the third degree.* The uterus may be entirely inverted. Toward the end of the third month the uterus either pushes its way past the promontory, or retroflexion with incarceration is produced, which in rare cases may continue to the end of a normal pregnancy. If a part of the fetus escapes past the promontory we have a *partial retroflexion* of the uterus (Fig. 103). Even then spontaneous reposition may take place during pregnancy by the upper portion descending forward and with the assist-

Tab. 47.

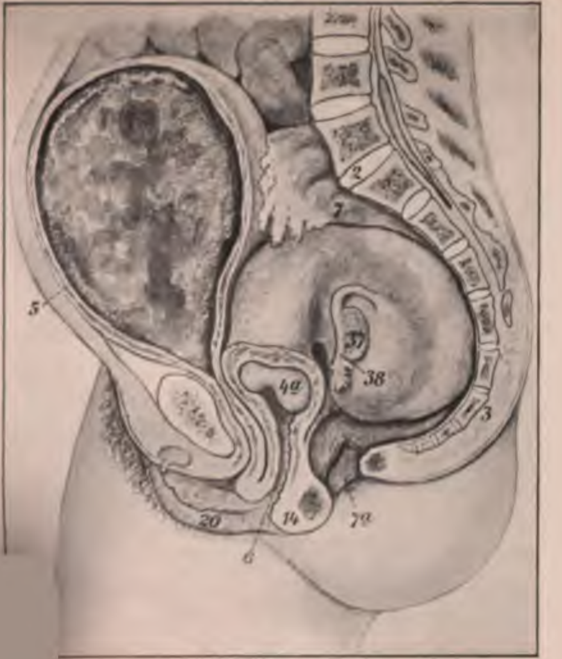

Fig. 102.

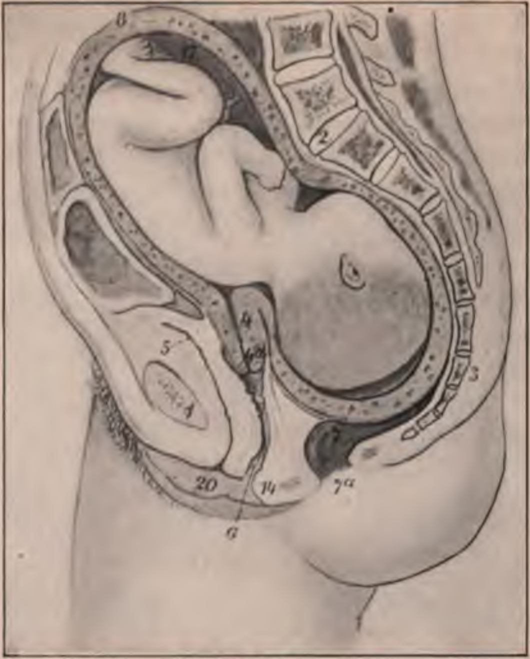

Fig. 103.

ance of labor-pains exerting traction on the posterior lower portion. By the term *spurious partial retroflexion* we mean an anteflexion of the uterus in which there is a sacculation of the posterior wall from any cause (uterus bicornis with pregnancy in the posterior horn, perimetritic adhesions, myoma—Dührssen).

The fetal part originally situated in the hollow of the sacrum—usually the head—may, instead of rising, force its way downward and eventually cause bulging of the perineum (Fig. 105) or of the wall of the rectum; or, after perforating the posterior vaginal wall, may cause prolapse of the retroflexed gravid uterus (Fig. 109) and appear at the vulva. The consequences of this accident, aside from spontaneous reduction with or without abortion, are hyperemesis, ptyalism, cystitis with abortion (retention and decomposition of the urine with necrosis and separation of the vesical mucosa, Fig. 102), halving of the bladder in such a way that one part is in front and the other behind and upon the uterus, and, finally, perforation of the rectum and vagina, or usually fatal rupture of the bladder and uremia; occasionally death of the fetus.

Paradoxical ischuria with absence of the menses is always an important factor in the *diagnosis.* Examination of the size and position of the uterus must never be neglected. The diagnosis can be definitely established by finding the angle between the portio vaginalis and the posterior part of the tumor continuous with it. The tumor gives rise to a spherical bulging of the posterior vaginal vault. The condition must be differentiated from tubal pregnancy with chronic adhesive peritonitis and coexistent retroflexion of the uterus, and from retro-uterine hematocele.

I once met with a case of the first kind which I was unable to diagnosticate in the second, or even in the third month until after the reposition of the somewhat enlarged and softened uterus, when I was able to demonstrate by palpation the growing tubal tumor. In such cases reposi-

FIG. 104. Von Winckel-Eisenhart's case of **Hernia Labialis Uteri Gravidi Bicornis** : C^1, C^2, cornua uteri ; *S*, septum.

FIG. 105. **Stage of Transition to Prolapse of the Retroflexed Gravid Uterus**, with perforation through the rectum or vagina or through the perineum.

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tion should not be attempted even after the state of affairs is accurately known, on account of the danger of immediate rupture of the sac.

Etiology.—Predisposing factors are firm adhesions, flat pelves with projecting promontories, tumors, a primary relaxed condition of the uterine walls, which become thickened by chronic metritis when these conditions are complicated with constant retroversion of a deeply placed uterus.

The first indication in the *treatment* is reposition, after evacuation of the bladder and rectum. Reposition is effected by drawing down the cervix with Muzeux forceps and pushing up the body of the uterus, either through the posterior vault or, in a standing or in Sänger's position (elevation of the pelvis), through the rectum or, possibly, through the abdominal wall. In many cases reposition requires the introduction of the round elastic Mayer's ring-pessary or of the colpeurynter (A. Müller), that is, a rubber bladder which is inflated after its introduction, care being had not to exert too great a pressure and thus rupture the vaginal vault. In order to evacuate the bladder it is sometimes necessary to raise the vaginal portion of the cervix and push it away from the symphysis. In gradual reposition by elastic pressure Sims's lateral or the knee-elbow position is sometimes employed (Fig. 63). Up to the sixth month the organ may be kept in position by a lever-pessary or by means of a round smooth ring.

If reposition is impossible, even under anesthesia and after dilatation with the colpeurynter, and if the urine becomes bloody and begins to decompose, puncture of the bladder should be performed ; as there is danger of the connective tissue surrounding the bladder becoming in-

Tab. 48.

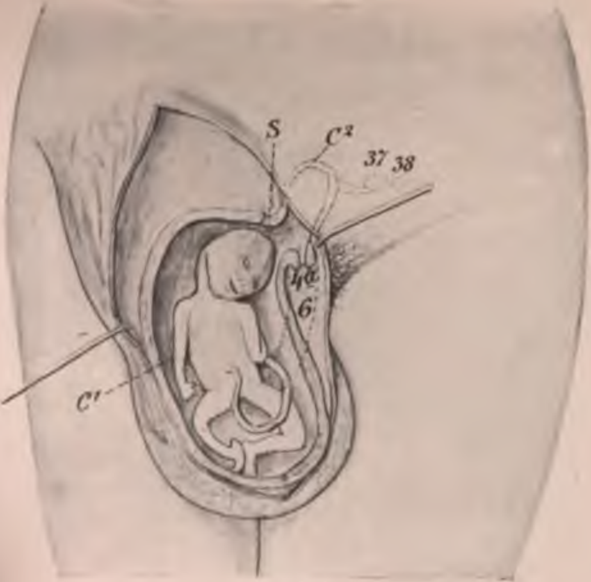

Fig. 104.

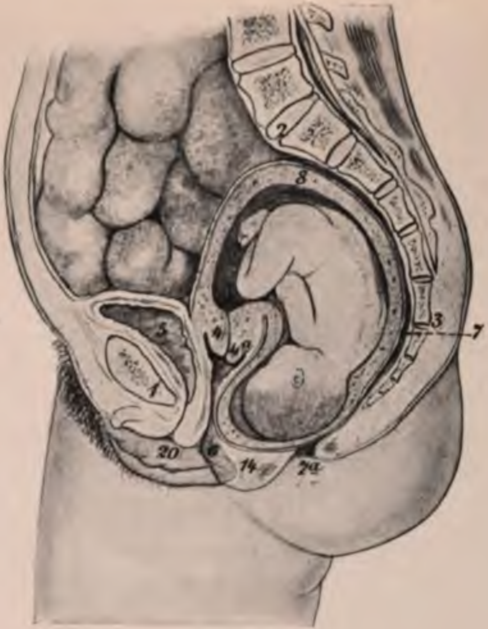

Fig. 105.

cause of premature expulsion of the ovum. Prolapse itself predisposes to abortion on account of the distortion and consequent disturbances to the circulation.

For these reasons the condition requires *treatment* during pregnancy, the best procedure being the introduction of a Mayer's hard-rubber or celluloid ring-pessary, which is left in place until the sixth or eighth month, or a plastic operation for prolapse may be performed. In a number of cases of so-called habitual abortion without marked prolapse of the uterus, but with descent of the uterus which was retroverted in the non-gravid state, owing to weakness of the suspensory and circulatory apparatus (chronic congestions and stasis), the author has seen this treatment followed by normal delivery of the child at term and relief of all the symptoms which had marked previous pregnancies. Abortion and premature delivery are very apt to bring on septic endometritis on account of the lacerated condition of the external os.

(*b*) *Anteflexion of the uterus* is of no special significance unless it is associated with pendulous abdomen or depends on inflammatory or operative wounds resulting in perimetritic adhesions or fixations (hysteropexy, vaginal and vesical fixation, ventral fixation), which render the organ absolutely immovable.

Since B. S. Schultze's investigations we know that the non-gravid uterus is normally inclined forward, and in vigorous organs, especially such as have already borne children, a slight anteflexion is added. During the first months of gestation this anterior position of the organ becomes accentuated on account of its increase in size and weight, as may be observed at each menstruation; the body of the uterus sinks deeper into the bladder, so to speak, the portio vaginalis rises, and the whole organ appears "tipped over" forward. Even in cases of retroflexion pregnancy nearly always effects a spontaneous replacement and anterior flexion of the uterus or, if the posterior wall is fixed by perimetritic adhesions or by tumors, anteflexion with posterior sacculation takes place.

When the abdominal walls are relaxed this tipping over forward is designated as an excessive "anteversio-flexio uteri" with pendulous abdomen, a condition which may give trouble in many ways and may even form a serious complication of labor.

The condition occurs most frequently in flat or antero-posteriorly contracted pelves, partly because the weight of the gravid uterus is not sufficiently supported by the anterior pelvic wall and partly because such a pelvic deformity is usually found in hard-working, badly nourished individuals with defective nervous tone, who had been rachitic in early life. As a result the mobility of the uterus is much increased, and in some cases there is a distinct flattening due to flaccidity or oblique distortion with a corresponding attitude of the fetus up to the moment of labor and even during its progress. The diminution in the available space, especially of the true pelvis in contracted pelves and the shortening of the abdominal cavity in scoliosis, also predisposes to anteflexion of the uterus. The same may be said of marked lumbosacral lordosis in rachitic women and of transversely contracted, oval pelves during the first months of pregnancy, because the symphysis is displaced forward and the fundus of the uterus thereby loses its normal support.

The predisposing factors in the abdominal walls are a relaxed condition, separation of the recti muscles, diminution in the thickness of the fasciæ and of the panniculus adiposus; those on the part of the ovum are hydramnion and twin pregnancies.

During the first half of pregnancy the fundus is still supported by the symphysis, the portio vaginalis being directed posteriorly. A true pathological fixation in anteflexion can exist, or at least continue to exist, only when there is some form of abnormal fixation.[1]

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[1] It is to be remarked in this connection that the body of the uterus normally descends during the first two months on account of its increased weight (Figs. 19 and 33), and thus forms an obtuse angle with the cervix. This phenomenon occurs again toward the end of pregnancy when the head enters the true pelvis (see § 1, *ad finem*).

FIG. 106. **A Fibromyoma,** springing from the lower uterine segment and posterior wall of the cervix, fills up the true pelvis and blocks the superior strait so that the head cannot enter the pelvis. The head becomes displaced forward and permits the hand to prolapse; that is, to slip under it into the anterior pole of the amniotic sac. The head is forced down upon the symphysis. The body of the tumor completely fills the lateral half of the pelvis. If the condition is allowed to go on until parturition, it may lead to lateral deviation of the head against the body of the iliac bone, to face presentation, or to oblique position of the fetus.

presence of submucous and interstitial or polypoid and cervical myomata, both on account of the structural changes and active secretion and hemorrhages of the hypertrophied mucous membrane, and on account of the mechanical blocking of the cavity of the uterus and of the internal os. Large subserous tumors may have the same effect by causing displacement or acute flexion of the adnexa (Fallopian tubes, ovaries).

This form of sterility is, therefore, the result of myomatosis. It is probable that there is also some primary cause for the development of myomata and for this absolute or relative sterility, but the connection has never been proved. It could not, in any event, be regarded as a law governing each individual case, but rather as a more or less frequent combination of co-existent symptoms of degeneration.

Among the **effects of pregnancy on the growth of myomata** we have already mentioned: *first*, the rising of the tumor and its incarceration below the promontory, conditions which have been found after the death of the child at the end of pregnancy; *second*, torsion of the pedicle with secondary softening and necrosis; *third*, necrosis due to disturbances of the circulation or to hemorrhages (tendency to thrombosis of the veins of the adnexa); and, *fourth*, rapid growth of the tumors.

The latter is due not so much to the increase in the number and size of the fibers as to a serous infiltration or edema which rapidly subsides during the puerperium; the fibrous elements show the greatest degree of prolifera-

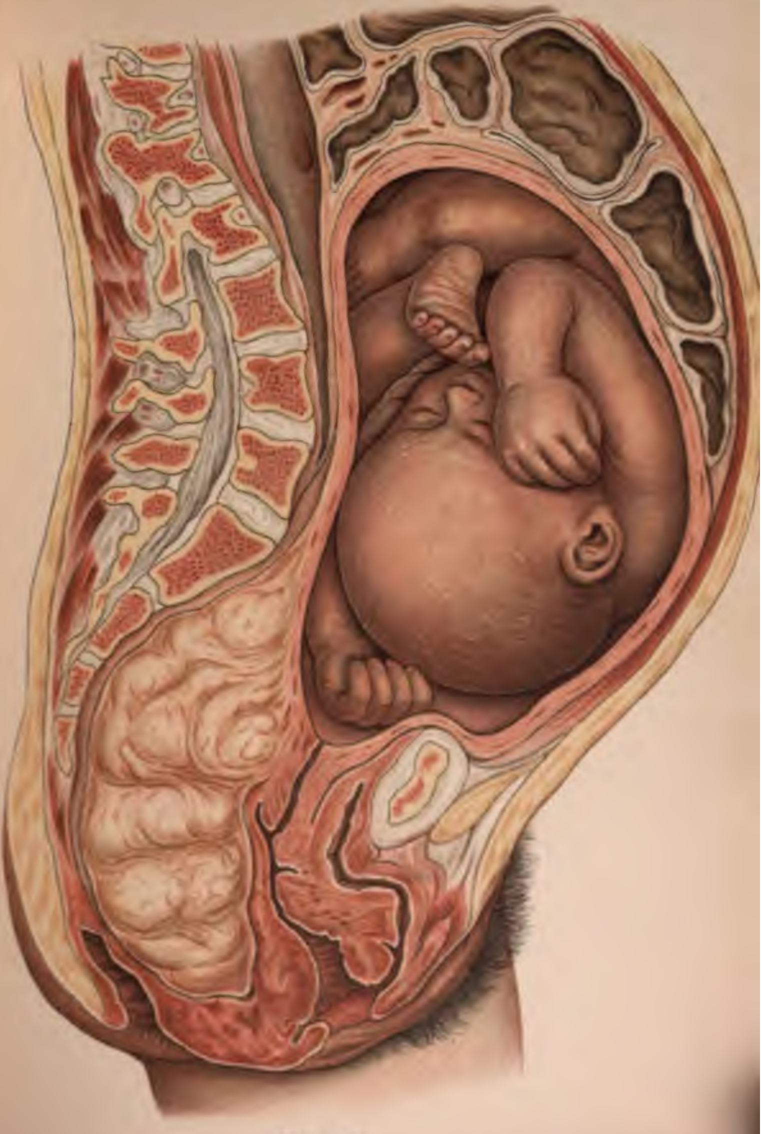

Fig. 106

Lith. Anst. F. Reichhold, München

tion. Numerical increase of the muscular fibers is observed only in true intramural tumors.

Fifth, the shape of the tumor adapts itself to the wall which forms its native soil, and therefore depends on the degree of distention; in most cases it becomes flattened and increased in its long diameter. This process may often give rise to central hemorrhagic or softening foci, which present a fruitful soil for the development of infectious germs (sloughing).

Sixth, a special form of displacement of the tumor consists in the loosening of the polypoid submucous or cervical myomata from their foundations and subsequent expulsion—the so-called birth of the tumor.

The *diagnosis* of a pregnancy complicated by the presence of a tumor is often very difficult. Small tumors, as a rule, either escape detection or pass for fetal portions, or they may even lead to the diagnosis of twin pregnancy. Large tumors are usually recognized without difficulty on account of their hardness, but not so the co-existing pregnancy, especially during the earlier months. In cases of intramural, cervical, and multiple myomata there is unfortunately an entire absence of Hegar's sign, or doughy consistency of the uterine wall about the internal os, and of the usual softness and lack of resistance to the finger of the body of the uterus. The entire list of probable signs of pregnancy must be reviewed and the presence of a soft tumor containing the fetus in juxtaposition to the hard myoma must be determined under anesthesia before the diagnosis can be established. It is to be remembered that the gravid uterus may be below and behind the tumor, and in such a case the body of the uterus with its contents can be palpated with the finger introduced into the rectum.

The diagnosis is often obscured by softening of the tumor simulating fluctuation, and by the fact that on the one hand the presence of a tumor alone is sometimes sufficient to cause mammary secretion, and, on the other hand, more or less copious periodical hemorrhages may

FIG. 107. **First Face Presentation** due to an obstructing myoma of the cervix which has become detached from the wall and been "born" before the child (placenta prævia marginalis).

FIG. 108. **An Enormous Subserous Uterine Myoma** prevents the entrance of the fetus into the true pelvis and gives rise to an abnormal presentation and attitude; deformities due to protracted diminution of the space and compression. (Both original drawings; Fig. 108 after a specimen in the Munich Gynecological Clinic.)

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persist in spite of the existing pregnancy. While in most cases repeated examinations with a view of determining the true nature of a tumor simulating pregnancy and of the rapid growth of one of the tumors or of the entire mass, with the typical concomitant symptoms, usually enable the examiner to arrive at a satisfactory conclusion, it occasionally happens that without incising the uterus a diagnosis cannot be reached even after the abdominal cavity has been opened.

The *treatment* during pregnancy follows naturally from the diagnosis and from the prognosis, it being remembered that the latter is to include the probable effects of labor and a consideration of the best methods to preserve the life of the child. Hence the proper estimation of such cases is of the utmost importance for every physician. We have the following possibilities before us:

1. *Inaction* following the development of events *sub partu*, "armed expectancy."

2. *Inaction* until labor-pains have begun.

3. *Inaction* until the child has become viable: (*a*) induction of premature labor; (*b*) Cesarean section, either to be preceded or followed by removal of the tumor or of the uterus.

4. *Inaction* until the advent of violent subjective symptoms or until there is imminent danger to the woman's life (by infection, especially in thrombosis); then,

5. *Inaction*, attempt at *reposition*.

6. *Immediate removal* of the tumor during the first months without interrupting pregnancy: (*a*) through the vagina (removal of polypi, enucleation of cervical myo-

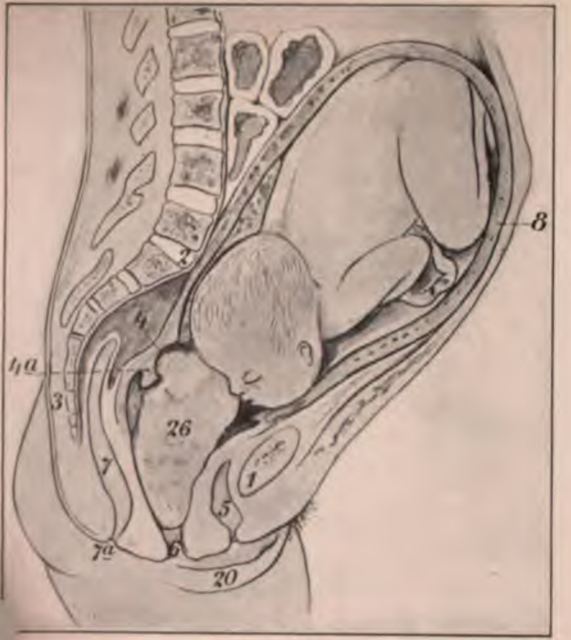

FIG. 107.

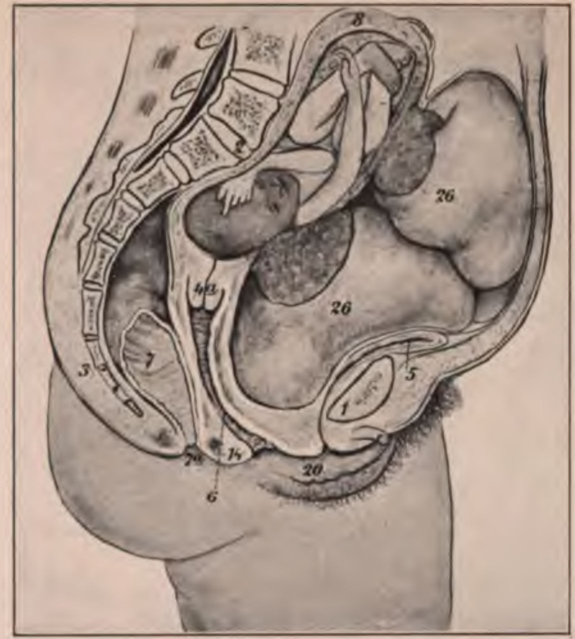

FIG. 108.

mata); (*b*) by celiotomy (removal of subserous polypi), myomectomy.

7. *Supravaginal amputation* of the gravid uterus by abdominal section during the first months.

8. *Total extirpation* of the gravid uterus.

9. *Induction of premature labor* or abortion, followed either immediately or later by removal of the myoma, or without such removal.

The *prognosis of myomectomy during pregnancy* is not very encouraging: 20 per cent. maternal and 45 per cent. fetal mortality. On the other hand, Stavely's statistics of five hundred and ninety-seven non-operated cases yield a death-rate of 37 per cent.

If a myoma is discovered during the early months of pregnancy the first question should be: "Are there any marked subjective symptoms?"; the second: "Are such symptoms to be expected before the child becomes viable?"; and the third: "Will the advent of labor at term give rise to dangers which at that time will be practically insurmountable; in other words, endanger the life of both mother and child; is the immediate removal of the tumor less dangerous than a subsequent removal would be?"

To answer these questions we need an exact knowledge not only of the condition of affairs at the time and of the general condition of the mother, but of the behavior during pregnancy and parturition of the particular variety of myoma present. To settle this point the above-mentioned data are of the highest value.

The first things to be considered are the size and situation of the tumor.

Small tumors within the body of the uterus should never be interfered with, although they may produce postpartum hemorrhage during the puerperium.

Cervical polypi are to be removed at once. Broad cervical tumors seated within the wall are best let alone until the beginning of labor, as their enucleation is very apt to give rise to profuse hemorrhages and other alarming symptoms, and to abortion. The same is true of all submucous myomata. The gaping wound which remains after their removal always involves great danger of hemorrhage or infection, either before or after expulsion of the ovum. Enucleation itself is quite easy on account of the relaxed condition of the tissues.

In large myomata situated in the cervix the possibility of immediate or subsequent replacement is first to be considered.

As in all the following large varieties of myomata we must remember first of all the law that a tumor, on the one hand, grows very rapidly during pregnancy, while, on the other hand, its form tends to adapt itself to the growth of the uterus, that is, the tumor becomes flattened and increased in its long diameter, so that the rising of the gravid uterus into the abdominal cavity, assisted by the labor-pains, may suffice to draw the softened tumor above the superior strait even in cases in which unsuccessful attempts at reposition have been made under anesthesia, and that thus the head or the breech may be permitted to engage. This is an important point to remember.

If the true pelvis is blocked by a large cervical myoma no attempt at reposition must be made before the eighth month of pregnancy, on account of the danger of abortion, unless symptoms of incarceration make their appearance. After that period, however, and especially at the onset of labor, reposition must be performed under all circumstances (if necessary in the lateral or knee-elbow position through the vagina and rectum; see methods of reposition in retroflexio uteri, §§ 15 and 20).

If reposition of the tumor is impossible, and if it appears to be so tightly wedged in that the uterus will in all probability not be able to draw it upward, it must be removed through an abdominal section. The question whether spontaneous reposition is likely to take place is extremely difficult to decide.

The *treatment* of subserous myomata wedged into the true pelvis underneath a gravid uterus is subject to the same considerations; since the possibility of spontaneous or artificial reposition is greatest in these cases the induction of premature labor is adapted to them. The indications for this procedure are the same as in contracted pelves. As, owing to the rigidity of the structures and the interference of the myoma with the strength and regularity of the contractions, there is frequently insufficient dilatation of the cervical canal and of the lower uterine segment, podalic version is to be preferred in such cases on account of its dilating action on the cervix.

If portions of fetal membranes are retained, or sepsis develops after abortion or parturition (metrophlebothrombosis), and should intra-uterine irrigation and curettage prove unavailing, immediate total extirpation is indicated.

The "ideal moment" for myomectomy through an abdominal incision is the end of pregnancy, because the life of the child is thus preserved and the danger to the mother is not materially increased, as the greater size and vascularity of the tumor are counterbalanced by its accessibility and the facility with which it can be enucleated. Removal of pedunculated subserous myomata is more justifiable because less apt to bring on an abortion than enucleation.

Myomectomy by celiotomy is indicated in the case of larger subserous, intraligamentary, or intramural tumors, and in large myomata of the cervix, whenever their growth or position, or the occurrence of softening, threaten to make them troublesome. Immediate operation is indicated only by the presence of intense subjective symptoms or imminent danger to life, such as twisting of the pedicle, irremediable incarceration, peritonitis, suppuration, and complicating organic diseases that typically accompany myomata (diseases of the heart, lungs, and kidneys).

In cases of this kind supravaginal amputation of the gravid uterus without evacuation is to be considered as long as the fetus is not viable; after the eighth month Cesarean section should be performed, followed by Porro's

FIG. 109. **Total Prolapse of Retroflexed Gravid Uterus,** due to pressure of a large pedunculated ovarian cyst on the left side, completely filling the true pelvis and reaching to the navel above; ischuria; rectocele.

FIG. 110. **Transverse Rupture of the Uterus** (*Ru.*), due to thinning of the wall by a cancerous ulcer of the cervix (*Ulc.*); anteflexio uteri puerperalis; *Pl.*, placental site; *C.R.*, contraction-ring; *A.Mm.*, external os (the preparation is shown in sagittal section).

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amputation. The stump is best disposed of by returning it into the peritoneal cavity. If the fetus is dead at this time, total extirpation without opening the uterus is often more advisable. Cesarean section alone is very dangerous and cannot be considered a rational mode of treatment. Total extirpation is more dangerous on account of the greater technical difficulty (although this is not always the case), the longer duration of the operation, and the necessity of opening the vagina. On the other hand, this operation gives the best hope when infection already exists, as well as with tumors which are so deep-seated that the vagina would in any case have to be opened, as in large myomata of the cervix.

(*b*) **Ovarian Tumors.**—Like certain myomata of the uterus, ovarian tumors often interfere with conception, but ovarian cysts do not show the same tendency to rapid growth during gestation; much more frequently they begin to grow after postpartum congestion is established. As intimated at the beginning of this section ovarian tumors rarely accompany pregnancy, although evidently not because of any sterility of the ovarian tissue due to the presence of the neoplasm, since cases of large bilateral ovarian tumors accompanying pregnancy have been reported.

Although pregnancy and parturition have occasionally been brought to a successful termination, yet the danger is so great as to constitute an absolute indication for the immediate removal of the tumor as soon as the diagnosis is established.

As the fundus of the uterus rises in the abdominal cavity it exerts a marked traction on the stalk of the

Tab. 51.

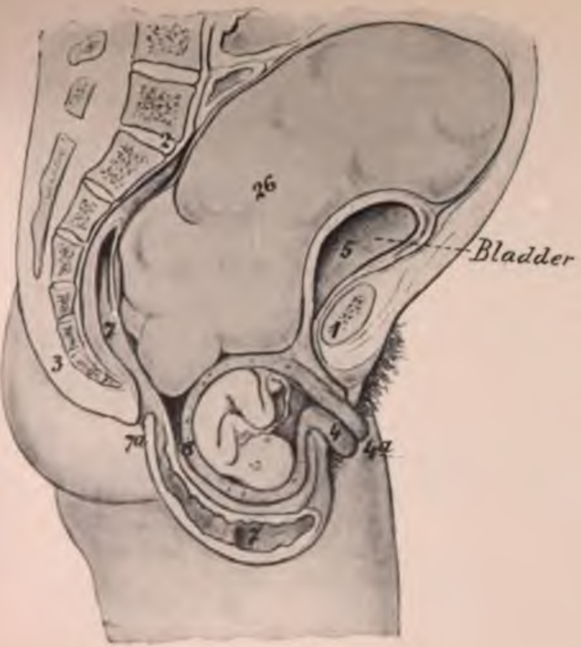

Fig. 109.

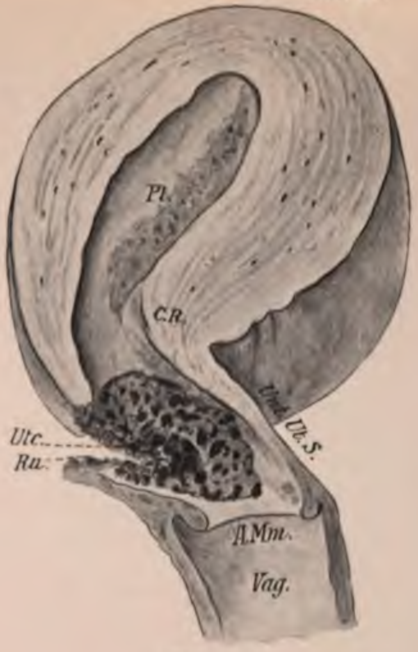

Fig. 110.

tumor, the insertion of which becomes relatively more and more deep, and thus circulatory disturbances are produced. In other cases the uterus has a tendency to rotate the tumor and produce a fatal torsion of the pedicle which is followed by necrosis and peritonitis; finally, if the wall of the tumor is brittle, the direct pressure on it may cause it to rupture. If the tumor is small it may remain within the true pelvis under the promontory and thus block the entrance of the head when labor sets in; this complication is particularly apt to occur in cases of massive ovarian fibromata, which, although fortunately rare, show a marked tendency to attain this fatal medium size.

Conversely, the tumor may be wedged in the superior strait and retain the uterus in a position of retroflexion and incarceration, or it may lead to incarceration of the uterus and thus bring on abortion. The latter may also occur without a complicating retroflexion.

The *diagnosis* of this complication must be made early, and it is therefore of the greatest importance for every physician to be able to recognize the condition with certainty. The complication is productive of great danger both during pregnancy and during parturition, and it is usually accompanied early by marked subjective symptoms. The usual symptoms of pregnancy are intensified and early become recognizable on account of the marked pressure, as in twin pregnancies. To these are added the discomfort of the tumor itself and the complications due to both conditions combined (diminution of the available space, constipation, vascular symptoms, torsion of the pedicle of the tumor, retroflexion, inflammations, etc.), so that a thorough examination is demanded.

The diagnosis is based on the demonstration of pregnancy; in other words, the presence of a gravid uterus and an additional tumor connected to it only by a pedicle. If the two tumors are moved in opposite directions with the hand the pedicle is stretched and may be palpated through the abdomen, vagina, or rectum.

Among the larger ovarian tumors to be considered in this connection the most frequent are *multilocular glandular myxoid cysts;* they are rarely large enough to constitute an obstacle to labor. The tumors are made up of numerous communicating cysts of varying sizes filled with a mucocolloid material. As they grow from the ovary they are connected with the uterus by a pedicle, consisting of the ovarian ligament, the vessels, and the tube.

These tumors are not in themselves malignant, but they may be accompanied by firm papillary proliferations which may take on a carcinomatous character by a *typical proliferating metastasis.* The cysts themselves are dangerous on account of their unlimited growth, of their exhausting effect on the entire body, and of the liability of the pedicle to become twisted, thus cutting off the blood-supply and leading to necrosis.

Dermoid cysts are recognized by the characteristic feel of their sebaceous contents, which are mixed with bones; they may also degenerate into carcinomata. It is evident, therefore, that these tumors all require speedy removal.

In the *differential diagnosis* the first possibility to be thought of is extra-uterine pregnancy and its frequent sequel, retro-uterine hematocele, which, after the tubal sac has ruptured, discharges its contents into Douglas' pouch, and there forms a tense elastic tumor behind the uterus and in apposition with the posterior vaginal vault. The tumor of a dilated bladder in retroflexion and incarceration of the uterus, subserous polypoid myomata, uterus bicornis, movable spleen and floating kidney, splenic tumor and hydronephrosis, echinococcic and bilateral ovarian tumors are also to be mentioned as possible sources of error in diagnosis.

Treatment.—As ovarian tumors *per se* demand removal much more than uterine myomata, and as their presence during gestation may give rise to complications which it is impossible to foresee (23 per cent. maternal, 39 per cent. fetal mortality), their extirpation during pregnancy is indicated in every case and in every month, although preferably in the beginning, irrespective of the existence or absence of complications. Even double ovariotomy rarely brings on an abortion. Operation is contra-indicated only when the child has reached the stage of viability (the thirty-fourth week), and no further complications are expected to arise from the tumor, especially when the parents are very desirous that the child should be preserved alive. The operation should not be attempted if the tumor is situated between the layers of the broad ligament, because the danger of hemorrhage is increased by the existence of pregnancy and the operation would be more dangerous than labor itself. In the case of small tumors within the true pelvis an attempt at reposition should be made, avoiding any rough manipulations on account of the danger of tearing the walls of the tumor.

Puncture is inadmissible on account of the danger of infection.

Induction of abortion or premature labor is adapted only to exceptional cases; thus, in tumors in which reposition is impossible on account of adhesions in all directions within Douglas' pouch, or on account of their intraligamentary situation, or which are of such a fibrous consistency that flattening is impossible.

(c) **Cancerous Growths of the Cervix and of the Vaginal Vault.**—Cancer of the uterus is not a very rare complication of pregnancy, and when it is present bodes very ill for both mother and child. The tumor itself grows very rapidly. The consequences are twofold.

Either the tumor, which is still rigid, altogether prevents the expulsion of the ovum in premature labor, or delays its escape so long that ulcerations are produced, which sometimes perforate into the bladder, and it becomes necessary to remove the fetus piecemeal; the rigid tissues may prevent the veins from contracting and thus give rise to air-emboli at the site of the ulcerations, or else the tissue alteration gives rise to hemorrhages and separation of the friable cancerous tissue. Carcinomata situated high up in the cervix lead to abortion, or, by secondary disease, to changes in the placental or fetal tissues and premature expulsion of the ovum. In addition, the force of the labor-pains is diminished and there is a greater danger of hemorrhage on account of the changes in the tissues of the uterus, or ulcerations are produced in the softened lacerated portions, especially in the cervix (Fig. 110) and in the vaginal vault. Finally, there is danger of septic endometritis and metrophlebothrombosis.

Breech presentations are more apt to be produced in premature labors.

The *diagnosis* from the decomposing remains of decidual tissue after an abortion, and from decomposing myomata and condylomata of the vaginal vault, is based on the demonstration of cancerous tissue and the characteristic nests in the portions removed for examination.

The *treatment* should be directed solely to the relief of the mother from her disease; hence, the possible methods of procedure are:

(1) In the first half of pregnancy (Olshausen) immediate total extirpation of the entire uterus through the vagina.

(2) Later, as long as the fetus is not viable, evacuation of the amniotic fluid and removal of the ovum, if necessary, by opening the anterior wall of the uterus and particularly of the cervix (Pfannenstiel and Reckman), followed immediately by total extirpation.

(3) After the thirty-second week: Cesarean section if the cervical canal cannot be sufficiently dilated by deep incisions (one long incision through the anterior wall, otherwise delivery *per vias naturales* and vaginal extirpation); this to be followed by supravaginal amputation and subsequent removal of the cervix through the vagina.

(4) In inoperable cases the life of the mother is to be preserved as long as possible in order to save the life of the child. Proliferation and ulceration are to be checked by means of the thermocautery and injections of arsenic and alcohol. These measures seldom produce abortion.

If premature labor occurs in an inoperable case, Porro's supravaginal amputation of the body of the uterus is to be performed, the stump being left outside the peritoneal cavity to prevent decomposition.

§ 17. ECTOPIC GESTATION.—PLACENTA PRÆVIA.

(A) ECTOPIC GESTATION.

(*a*) **Tubal Pregnancy.**—In by far the greater number of ectopic gestations the ovum develops within the tube, usually in its middle and in the dilated portion or ampulla. From the middle portion the fetal sac may push its way in between the layers of the broad ligament and form an intraligamentary pregnancy. An intraligamentary gestation due to rupture of the sac is known as *grossesse souspéritonéopelvienne.*

An impregnated ovum often lodges in a tubo-ovarian cyst or in diverticula of the tubes. If the egg becomes arrested at the fimbriated extremity a tubo-abdominal pregnancy usually results.

In all these cases the fetal sac can be *diagnosed* as a pedunculated tumor (Fig. 112).

If the ovum lodges in the isthmus of the tube an interstitial tubo-uterine gestation is produced (Fig. 117). It is distinguished anatomically from the above-mentioned tubal pregnancies by the fact that the round ligament lies to one side and the gestation-sac pushes its way into the uterus. Both tubal orifices are occluded in these cases. As the isthmus is very unyielding these gestation-sacs rupture in almost every instance; rarely the ovum may be expelled into the cavity of the uterus.

In a tubal pregnancy the gestation-sac is composed of peritoneum, the muscular layer of the tube, tubal decidua vera and circumflexa—which latter, if present at all, only partially encircles the ovum—the fetal chorion, and amnion.

The decidua vera is formed from the stroma of the tubal mucosa; the cylindrical epithelium is cast off, there is a proliferation of large cells and the papillæ of the stroma are converted into decidua consisting of a newly formed reticular layer of tissue into which the chorionic villi penetrate. The intervillous circulation of maternal blood is occasionally established by the second month, but there is never a very intimate interlacement of fetal villi with the vascular prominences of the decidua in the serotinal zone. The danger of rupture arises from the fact that the muscular layer does not hypertrophy. In interstitial tubo-uterine pregnancy the

FIG. 111. **Gestation in the Rudimentary Horn of a Uterus Unicornis** (after total extirpation, by Kelly, of Baltimore).—As the rudimentary horn is shut off from the uterine cavity and the corpus luteum is found in the ovary of the opposite side, it is evident that intraperitoneal transmigration of the ovum has taken place.

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decidua is very thin, so that the villi dip into the muscle-bundles and penetrate into the venous capillaries.

The uterine mucosa also becomes converted into a decidua by the proliferation of large cells, the process being accompanied by a simultaneous increase of the entire organ both in length and in breadth. This uterine decidua is usually expelled between the second and fourth months with profuse hemorrhages, the muscular layer of the uterus also becoming hypertrophied (Figs. 15, 67, *a* and *b*).

The superficial layer is not covered with epithelium; the lumen of the glands, which are also deprived of epithelium, is narrowed down to a minimum while the capillaries are much dilated. In the deeper layers the gland-ducts are covered with several layers of epithelium.

The *diagnosis* in most cases is exceedingly difficult, especially during the first months.

The expulsion of decidua which we have just mentioned is an important sign and justifies the introduction of a sound into the uterine cavity, which, as has been explained, will be found enlarged in every direction and empty. The surface which was in contact with the uterine wall shows the openings of the glands between irregular fissures, while on the other side, looking toward the cavity of the uterus, the openings are found in a closer meshwork, resembling latticework (Fig. 67, *a* and *b*).

By a careful combined examination the presence of a tumor distinct from the uterus is made out, and if the gestation-sac is situated in the free tubal extremity the tumor will be pedunculated. If the tumor is soft and elastic, the child in all probability is still alive; if, on the other hand, hard nodular areas can be felt, the fetus is dead, and it is possible to palpate the extravasation which

Tab. 52.

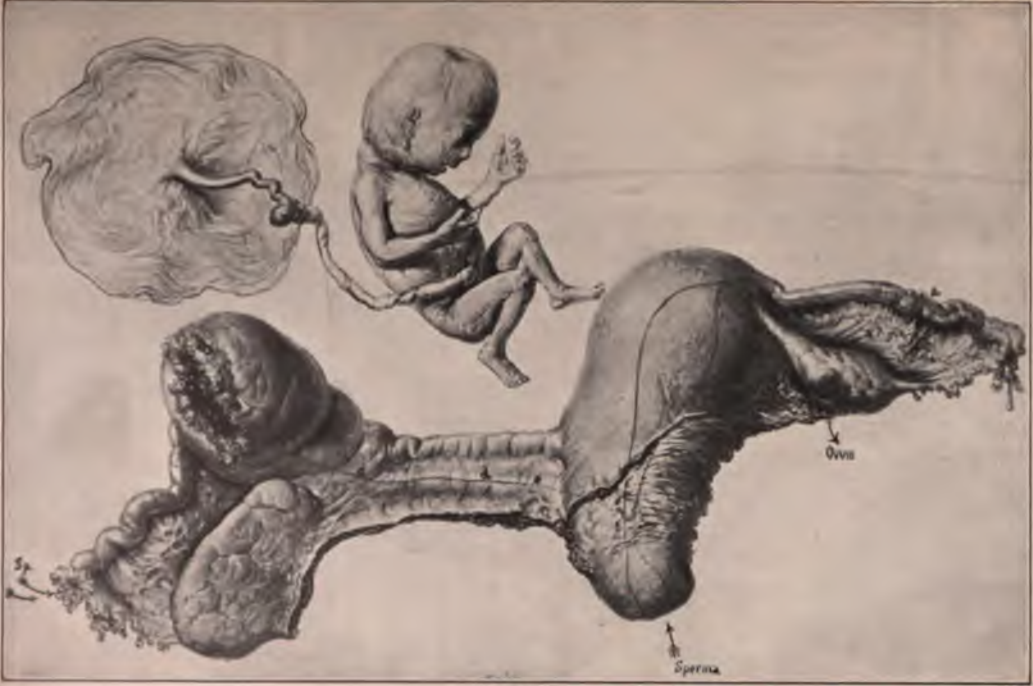

FIG. 111.

takes place into the fetal membranes and is accompanied by a diminution of the amniotic fluid.

If the idea of pregnancy has been entertained to begin with, the examiner is struck by the unexpectedly early rising of the gravid portions above the symphysis, and on auscultation the diagnosis may be confirmed by hearing the fetal heart-sounds in that area. The subjective symptoms are much intensified and the fetal movements in the fifth month occasion the woman great pain.

From the fourth to the fifth months various portions of the fetus can be distinctly palpated.

A normal uterine pregnancy may be complicated with extra-uterine gestation; extra-uterine pregnancy on both sides and extra-uterine twin pregnancy have even been observed. The diagnosis of rupture of the gestation-sac is based on all the symptoms of internal hemorrhage with violent shock and collapse. After the third month rupture is especially to be dreaded on account of death from internal hemorrhage. The retro-uterine hematocele is felt like a tense tumor behind and by the side of the uterus. In some cases rupture takes place without a marked hemorrhage, and the gradually escaping ovum has time to attach itself by one pole to the serosa and establish a new blood-supply.

Differential Diagnosis.—The menstrual history aids in the differentiation from ovarian cysts, subserous fibroma, and pelvic abscess (fever); retroflexion of a gravid uterus (§ 15) is always attended with marked ischuria, which is absent in ectopic pregnancies, not to mention rupture of the amniotic sac and the anterior displacement of the portio vaginalis and thinning of the anterior lip of the os, which we observe in the former condition.

Among the anatomical *causes* of tubal pregnancy, the most important is gonorrheal alteration of the cylindrical epithelium.

The cells become swollen and lose their cilia. In addition, the inflammatory proliferation of the papillary stroma gives rise to an

FIG. 112. **Tubal Pregnancy on the Right Side; Left Lateral Displacement of the Uterus; Corpus Luteum Verum on the Left Side.**—Transmigration of the ovum.

FIG. 113. **Ruptured Tubal Gestation-sac**; child in Douglas' cul-de-sac; adhesive peritonitis leading to kinking of the right tube. Right lateral displacement of the uterus (original drawing from a specimen in the Munich Gynecological Clinic).

interlacing mass of excrescences, the minute cleft-like interstices of which are filled with secretion and partially desquamated epithelium. The connective-tissue growth which accompanies the deeper interstitial inflammation destroys the contractility of the muscularis and thus the further progress of the ovum is arrested.

Coarse primary alterations may be causative in preventing the passage of the ovum, as, for instance, when the Fallopian tube is constricted or acutely flexed by adhesions in localized peritonitis; another cause is found in the congenital malformations sometimes occurring in the tube in the form of marked convolutions (Freund).

The same effect may be produced by tuberculosis with cheesy degeneration as by severe gonorrheal salpingitis. Uterine polypi blocking the orifice of the tubes, or similar tumors and small myomata in the tube itself (salpingitis nodosa of the uterine portion of the tube), may prevent the entrance of the ovum into the uterine cavity. Emotional disturbances, even within the sphere of sexual life, and extra-uterine transmigration of the ovum may, in addition, prevent the impregnated ovum from following its normal path (Figs. 111 and 112). In such cases the condition is usually preceded by total or at least long-protracted sterility.

The *results* of ectopic gestation are as follows:

1. Pregnancy may go on to term and the fetus die unless it is delivered by means of a celiosalpingotomy.
2. Labor-pains come on and the ovum is expelled (born) into the abdominal cavity through the fimbriated extremity (tubal abortion, Fig. 116).
3. Rupture of the gestation-sac either into the abdominal cavity (Fig. 113) or between the layers of the broad ligament.

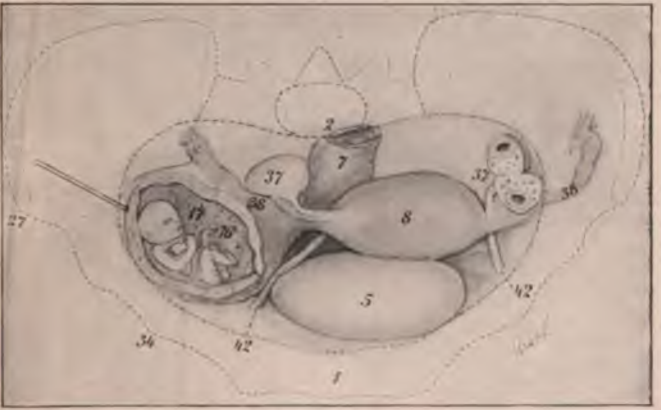

FIG. 112.

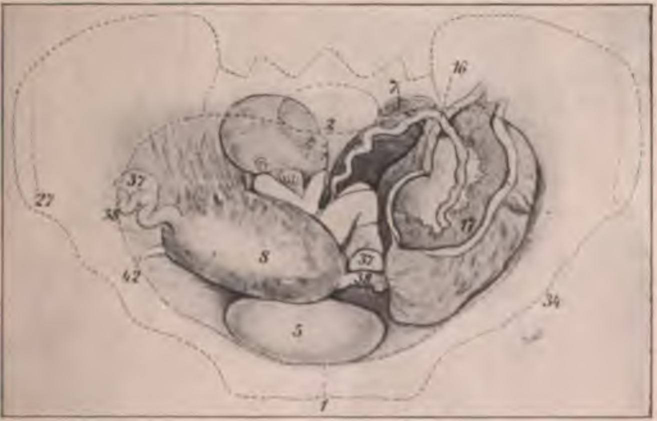

FIG. 113.

FIG. 114. **Perforation of a Tubal Sac into the Bladder and Rectum by Fetal Bones,** the fetus having undergone absorption. Anteversion of the uterus.

FIG. 115. **Ovarian Pregnancy.**—Adhesive peritonitis; kinking of left tube.

FIG. 116. **Abdominal Pregnancy.**—Adhesive peritonitis.

FIG. 117. **Interstitial Extra-uterine Pregnancy.**

FIGS. 114–117. Original drawings, after specimens from the Munich Gynecological Clinic.

As regards the *diagnosis* I can only refer to that of a tubal pregnancy.

Course.—Abdominal gestation may end in various ways:

1. The child lives to term and labor-pains make their appearance.

2. Premature labor-pains, separation of the placenta, hemorrhage into the placenta, death of the fetus.

3. After death the fetus undergoes the same changes in this variety as it does in tubal and ovarian pregnancies. These changes are as follows:

(*a*) *Absorption,* the rapidity depending on the number of septic micro-organisms present. The amniotic fluid and the tissue-juices are absorbed, the fetus and fetal membranes coalesce, the mass becomes organized by the proliferation of granulation-tissue as far as the bones, or septic peritonitis results.

(*b*) *Expulsion,* with or without absorption, by ulceration through the bladder, the rectum (Fig. 115), the vagina, or the anterior abdominal wall, the ulceration resulting from the action of micro-organisms within the tubes.

(*c*) *Calcification* beginning in the peritoneal bands (usually in the absence of septic micro-organisms). It may be of various kinds:

(*α*) Lithokelyphos, or calcification of the membranes, the child being completely preserved within this calcified envelope.[1]

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[1] As, for instance, in the cases of Virchow and Küchenmeister, and the London and Langensalza "petrified infants."

Tab. 54.

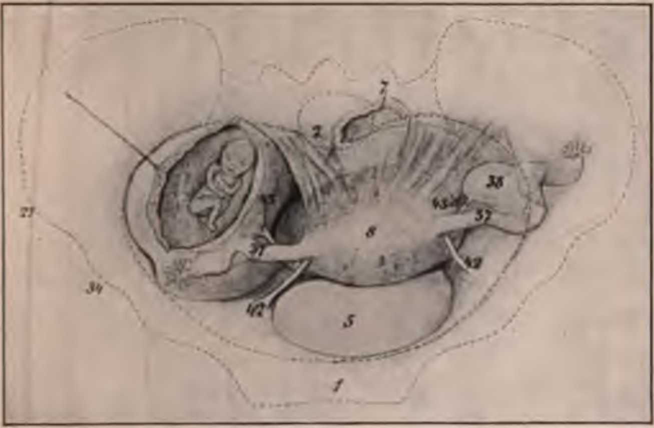

FIG. 114.

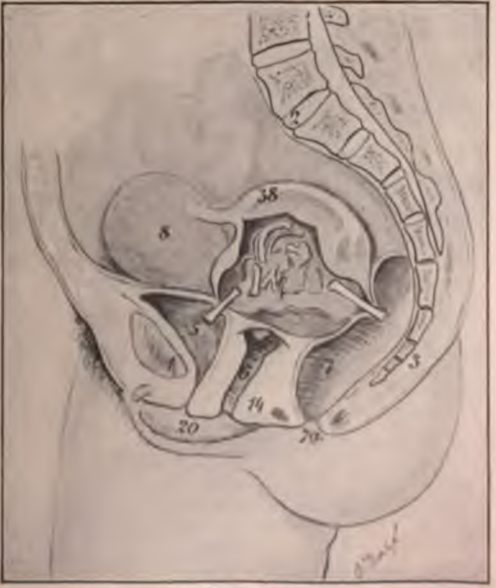

FIG. 115.

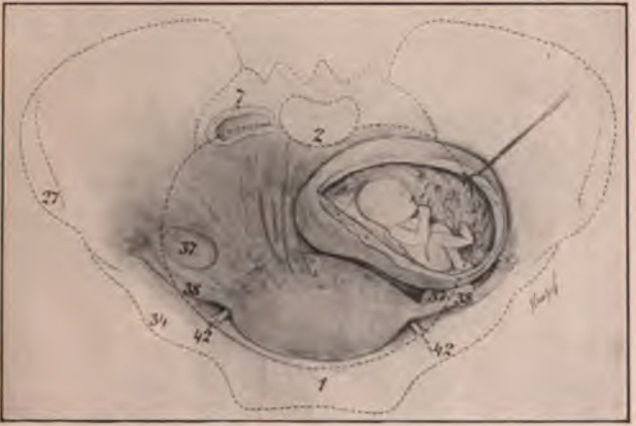

Fig. 116.

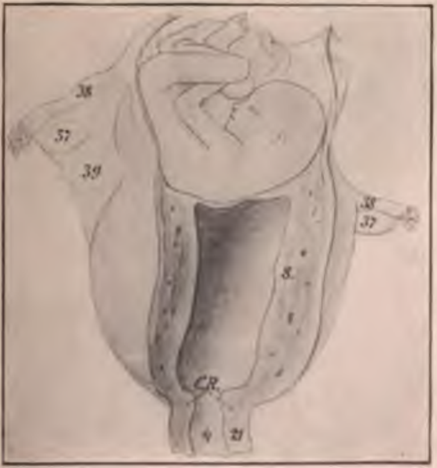

Fig. 117.

(β) Calcification of the contiguous surface of the fetus—lithokelyphopædion.[1]

(γ) Impregnation of the fetus with lime-salts with entire absence of the fetal membranes—lithopædion; the internal organs are only partially involved in the calcification; they undergo a fatty change and are converted into lime-soap, resembling ambergris.[2]

(*d*) The fetus remains as a skeleton.

(*c*) **Ovarian Pregnancy.**—This is the rarest form of all. Impregnation takes place:

(1) *In the follicle*, because the rupture is too small for the escape of the ovum.

The chorion dips into the surrounding stroma, the decidua is contributed by the zona granulosa of the Graafian follicle, assisted by the ovarian stroma. The stalk of the tumor is formed by the ovarian ligament.

(2) The ovum becomes impregnated primarily in the follicle and the gestation-sac, embedded in masses of fibrin, projects into the abdomen forming an ovario-abdominal gestation.

(3) Tubo-ovarian pregnancy results if a congenital or acquired ovarian tube is present (from perisalpingitis and kinking of the tube, cf. § 1).

(4) The ovum is impregnated in a tubo-ovarian cyst. A small cyst from a partially degenerated ovary ruptures into a tube and hydrosalpinx results.

Ovarian gestation has been observed once or twice in an inguinal hernia containing an ovary. The fetus rarely attains maturity in this form of ectopic gestation.

Treatment of Ectopic Gestation.—The most favorable termination is premature rupture of the gestation-sac in the first two months, followed by absorption of the fetus, or early mummification and petrifaction if the fetus is too large to be absorbed; but even under these conditions 25 per cent. of the cases terminate fatally. After the second month the mother's life is threatened by hemorrhages, and the fetus, on account of its greater size, is more apt to undergo decomposition.

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[1] For instance, the petrified infants at Leinzell and Pont-à-Mousson.

[2] The petrified infants at Heidelberg, Lübben, and Toulouse.

The question of treatment is still a very difficult one to decide. The ideal procedure—inaction until the child has come to maturity and preservation of both mother and child—is a very risky undertaking in view of what has been said above and of our modern methods of operation. The indications are about as follows:

(1) During the first three months injection of gr. ss (0.03 gm.) of morphin, once repeated, into the amniotic sac may be tried under certain conditions, without aspirating the amniotic fluid and under strict antiseptic precautions, with a view of bringing about the death of the fetus (v. Winckel).

(2) If the fetus continues to grow in spite of this, or if the subjective symptoms become violent or alarming—and this applies especially to obscure cases—an abdominal section should be made. Opening of the vaginal vault and pouch of Douglas is permissible only when the tumor is small, distinctly pedunculated, and non-adherent.

(3) In advanced ectopic gestations the fetus may be allowed to go on to viability only in case the marriage has been sterile and a living child is earnestly desired. The mother should then be confined to bed. Otherwise immediate celiotomy is indicated; or,

(4) If the fetus is dead, it should be removed some time later (preferably six months) by means of a celiotomy.

(5) If rupture has taken place, celiotomy may be performed if the woman is not in too profound a condition of collapse and rupture has occurred only a few hours previously; if the symptoms of hemorrhage are too severe or the shock is too profound, the patient must not be deprived of the extravasated blood. The treatment then consists of absolute rest, opiates, antispasmodics, the application of a sand-bag to the abdomen, elevation of the pelvis, and subcutaneous, rectal, and intravenous injections of decinormal salt solution; the fetus being removed later.

If the accident has occurred some time previously, and there is no immediate danger, an expectant policy may be adopted.

(6) If, during the later months, the gestation-sac cannot be removed, it is to be fixed extraperitoneally into the abdominal wound and tamponed.

(7) In suppuration of the hematocele incision through the vagina and drainage are indicated.

(B) PLACENTA PRÆVIA.

If the attachment of the ovum to the uterine wall is abnormal, so that the decidua serotina is inserted in the lower uterine segment from the very beginning of pregnancy (with the exception of a few cases in which the decidua reflexa, which is usually devoid of glands and vessels, is traversed by loops of blood-vessels), the condition known as placenta prævia results. As a result of the uterine contractions, the lower uterine segment undergoes marked passive distention even during pregnancy, but particularly during labor. The traction thus exerted tends to loosen the placenta, which then either blocks the entire internal os in the form of placenta prævia *centralis* (Fig. 13 in the text), or the edge projects over the orifice, when the condition is known as placenta prævia *marginalis* (Plate 23, and Fig. 14 in the text). Depending on the variety of placenta prævia present we have, after the seventh month in placenta prævia centralis, after the eighth month in placenta prævia lateralis, after the ninth month in placenta prævia marginalis, as an important diagnostic sign, *hemorrhage* due to injury of the placental vessels, and, rarely, of the fetal vessels within the chorionic villi or even to laceration of the placenta. If this accident occurs during pregnancy, a placenta prævia centralis is converted into a placenta prævia *succenturiata* (Fig. 13 in the text); if, on the other hand, one lobe of the placenta is torn away during labor, the placenta prævia centralis is converted into a placenta prævia lateralis.

The hemorrhages which not infrequently occur in the first half of pregnancy are explained partly by the uterine contractions, partly by the loosening of the villi from the attenuated lower uterine segment, particularly when the placenta is much flattened.

The abnormal insertion of the placenta takes place at the very beginning of gestation. Thus, Hunter and Gottschalk have found ova inserted at the internal os as early as the first month.

(*a*) The uterine cavity may not be adapted to the reception of the ovum. This is the case in fibromyoma; in malformations and malpositions of the uterus (uterus unicornis, bicornis, or deep insertion of the oviducts); in defective involution and consequent dilatation of the cavity, as when the woman is allowed to get up too soon; in relaxation of the uterine wall due to several rapidly succeeding pregnancies, a condition to which older women in their second or third pregnancies are particularly liable; or in cases of abnormally wide uterine cavities due to chronic catarrh (metritis)—in all of which conditions there is an incomplete decidua formation owing to disease of the mucous membrane.

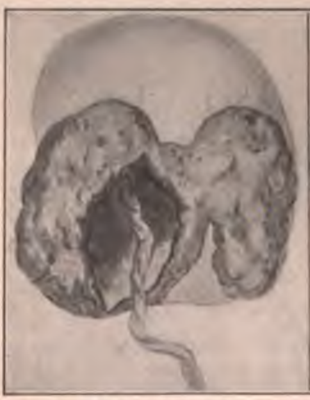

FIG. 13.—Placental infarct.

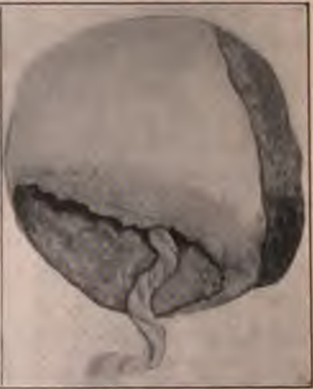

FIG. 14.—Placenta prævia.

(*b*) The condition of the lower uterine segment itself may be such as to favor a low insertion near the internal os. This occurs in cancer of the cervix, because, as in endometritis, the decidua reflexa is prevented by the cancerous secretion from undergoing liquefaction; there is a marked increase in the vascular supply, especially in the fold of the reflected portion, causing the chorionic villi topersist in that region. It occurs also in old lacerations of the cervix.

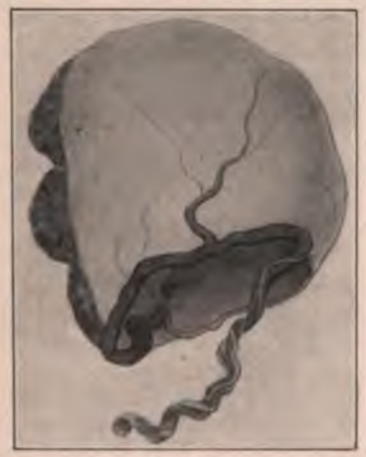

FIG. 15.—Velamentous insertion of the placenta.

(*c*) Lastly, when the decidua serotina covers an abnormally large area; hence, the condition is especially liable to occur in twin pregnancies.

We must also emphasize the frequent occurrence of *velamentous insertion* (Fig. 15 in the text), *placenta succenturiata*, *marginata*, *membranacea*, and of *placental infarcts* (Fig. 13 in the text), in combination with placenta prævia (Figs. 96 and 101).

It is evident, therefore, that disease of the endometrium and its inability to nourish the ovum are the most imsequent extraction, one foot being brought down to act as a tampon; or, without version, the uterus may be tamponed with iodoform, nosophen, or silver gauze until the os is completely dilated; analeptic remedies (antispasmodics), ergotin, and, if necessary, subcutaneous or rectal injections of 0.6 per cent. salt solution may be given. In longitudinal presentations the hemorrhage may be stopped by rupturing the bag of waters. In postpartum hemorrhage due to atony resort may be had to ergotin, bimanual rubbing and kneading of the uterus, which should be anteflexed, either with one finger in the uterine cavity or—if it can be done at once and for the purpose of combining massage—from without, followed by tamponade of the uterine cavity after Dührssen. The most effective measure is to draw down the uterus in front of the vulva and seize the portio vaginalis with a pair of stout Muzeux forceps. The kinking of the uterine vessels, which is thus effected, directly diminishes the hemorrhage and acts indirectly to produce contraction on account of the accumulation of carbon dioxide. Not infrequently the placenta has to be removed with the hand introduced into the uterus.

CHAPTER VI.

DEFORMITIES OF THE PELVIS AND THEIR INFLUENCE ON PREGNANCY AND LABOR.

§ 18. GENERAL REMARKS ON THE DIAGNOSIS AND TREATMENT OF DEFORMED PELVES.

FOR the **diagnosis** the reader is referred to § 3. The effect of skeletal deformities on the pelvis is to be borne in mind and careful palpation of the pelvic cavity must never be neglected.[1]

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[1] Kyphosis in the lower portion of the column suggests a funnel-shaped pelvis. Scoliosis and a limping gait point to an oblique pelvis, while the characteristic rachitic deformity with joint enlargements and pendulous abdomen should arouse the suspicion of a flat pelvis.

Both internal and external asymmetry can be determined by inspection and palpation. In rachitic pelves the distance between the spines is equal to, or greater than, the distance between the crests. In obliquely contracted pelves one iliac bone is often higher than the other. In equally contracted pelves the interspinous distance is equal to, or less than, a span from the thumb to the little finger ($8\frac{3}{4}$ in. = 23 cm.). Internally we determine the configuration and width of the linea terminalis; the position of the promontory, especially with relation to the superior strait; the condition of the cartilage in the symphysis (cf. § 20, No. 12); and the inclination of the symphysis (more vertical in rachitic pelves). We also determine whether the promontory and symphysis are in the same sagittal plane or not (oblique pelves). We first palpate the tuberosities and the spine of the ischium, ascertain the width of the pubic arch (the distance between the former is diminished in funnel-shaped pelves, the latter is greater in rachitic pelves), and examine the coccyx for a possible anterior luxation. Exostoses are to be sought for in the sites of predilection mentioned in § 20, No. 12. The history of former labors is also of great importance.

By *pelvimetry* we detect general contractions of the perimeter of the pelvis or diminution of single diameters: the true conjugate of the oblique diameters or the transverse diameter. The measurements of the pelvic outlet are also ascertained.

If the diminution of the conjugate is due to rachitis, we must subtract more than the usual number of centimeters from the diagonal conjugate on account of the more vertical position of the symphysis; that is, instead of $\frac{5}{8}$ in. (1.5 cm.) we subtract from $\frac{4}{5}$ to 1 in. (2 to 2.5 cm.). (See §§ 3 and 4, the relations between the external conjugate of Baudelocque in flat rachitic pelves and the influence of the woman's position on pelvic measurements, Walcher's position; also the value of external measurements in the

determination of the size of the superior strait, especially in contracted pelves; cf. § 3.)

The rigidity of the pelvic joints and the compressibility of the fetal skull during labor have been referred to in § 7, under "Configuration of the Skull." A pelvis is considered contracted in the obstetrical sense not only when it constitutes an obstacle to labor, but when it leads to abnormal presentations; Litzmann assumes as a limit for the true conjugate 3⅞ to 4 in. (9.7 to 10 cm.).

Anomalies in shape and position of the uterus and of the fetus during pregnancy also interfere with the proper entrance of the fetus into the true pelvis.

The duration of labor is increased by half; in 56 per cent. of all the cases the head does not engage in the true pelvis until the external os is completely dilated. As a result the bag of waters frequently ruptures prematurely, that is, before the os is completely dilated. In flat pelves there is a large amount of amniotic fluid in front of the head and this permits prolapse of the cord or of one of the extremities, and leads to further anomalies in the attitude and presentation of the child.

The force of the labor-pains is not diminished *a priori*, but they may become weaker secondarily; at least, their effect may be diminished because some of the muscle-fibers go into a state of partial spasm from failure of the head to descend or subsequent fixation of the cervix between the head and the pelvic wall. Premature discharge of the amniotic fluid—in which case the dilatation of the os is accomplished with much more pain to the mother by the pressure of the head, and edema, lacerations, and contusions are apt to result—abnormal positions of the child, and, finally, old scars in the vaginal vault may also impair the strength of the labor-pains. The lower uterine segment is very much distended, hence, pressure-necrosis and rupture or perforation are very apt to occur.

The joints of the pelvis may be torn apart either by raising the handles of the forceps too early, especially if the operator indulges in forced rocking movements from side to side, or, more rarely, when the head has reached its limits of compression and accommodation to the pelvic cavity. Among the predisposing factors to this accident are primary inflammations and suppurations, osteomalacia, caries, tumors, and, in funnel-shaped pelves, the leverage which the descending rami of the pubis exert on the symphysis during the passage of the head.

The **diagnosis** of separation is made by feeling the bones give way and by the presence of constant pain and abnormal mobility. The bones reunite with or without the application of a binder. The latter consists of two towels passing around the region of the sacrum, crests, and spines, tied together above the symphysis (Ahlfeld). Artificial separation of the symphysis or symphysiotomy has lately come into vogue again to prevent laceration of the perineum, and has been attended with some success, but it should be attempted only in hospitals.

Injuries to the child consist in disturbances of the placental circulation, and, therefore, of the respiration, by the powerful contractions with which the uterus attempts to overcome the obstacle presented by a contracted pelvis. In some cases the uterus may go into tetanic contraction. As a result of long-contined pressure, especially if the amniotic fluid is evacuated early, we have edema, bruises, necroses, depressions, and fissures and fractures of the skull. The overlapping of the bones of the skull may be excessive (cf. Figs. 130–133*a*, and § 20, under No. 3*a*). Such injuries lead to the formation of cephalhematomata or of subdural extravasations. Fracture may also occur at the base of the skull or in one of the cervical vertebræ. The size of the fetal head and body must be determined by bimanual examination (see § 2), remembering that in a multipara the resistance offered by the maternal soft parts and the size of the head are greater than in primiparæ. An important procedure, both from a diagnostic and from a therapeutic point of view, is to exert moderate pressure on the head once a week for from one to one and one-half minutes, if possible as early as the twenty-eighth to the thirtieth week, so as to force it to enter the superior strait.

In the matter of **treatment** it is to be remembered that:

(1) According to v. Winckel, seven-tenths of all labors in contracted pelves are terminated without operative interference; and,

(2) That the most scrupulous asepsis is to be observed from the very first examination, even if the accoucheur is convinced beforehand that an operation will probably be necessary. The fissures and excoriations which are always produced are very liable to become converted into ulcerating surfaces covered with the semifluid, greenish exudate characteristic of septic invasion. The expectant treatment consists in carefully controlling the advance of the head and the strength of the labor-pains, that is, a primipara should be forbidden to bear down at all, and in every case abdominal pressure should be forbidden until the head has passed the superior strait. The labor-pains may be regulated by the application of hot compresses, baths, mustard-plasters, and the administration of morphin, chloral hydrate, and chloroform. The woman should lie on the side on which the presenting part is felt. If the abdomen is pendulous it should be supported by means of a binder. The upper part of the body should also be supported until the head engages in the superior strait; in some cases it may be necessary to put the woman into Walcher's position (see § 4). The diagnosis is finally confirmed and the treatment completed by the above-mentioned external pressure on the head. The general indications for operation, as far as the pelvis is concerned, have been mentioned in § 20, under No. 2*a*, foot-note. The special indications will be found in the *Atlas of Labor and Operative Obstetrics.*

If the head fails to descend and is still movable, or if it is impossible to convert a face presentation with the chin posterior into a vertex presentation, version is indicated if the child is alive and the true conjugate is not

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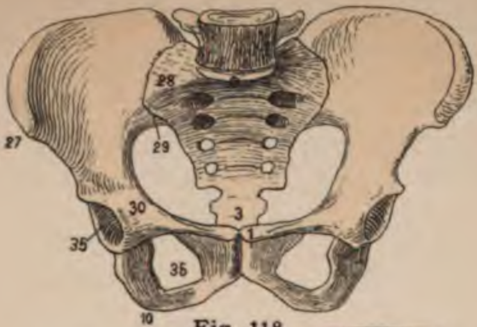
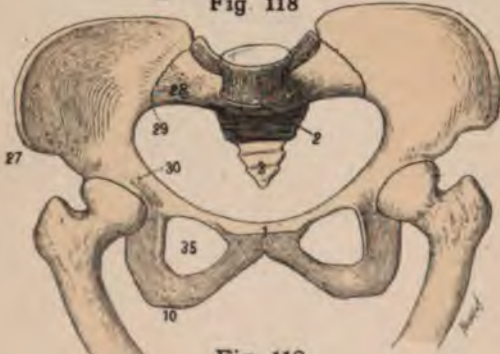


Fig. 118



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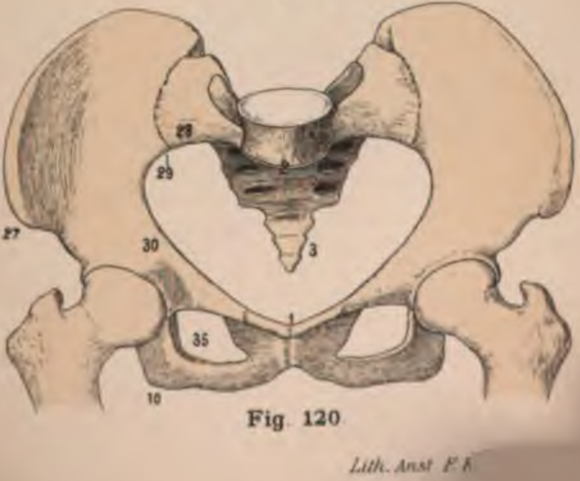

Fig. 120

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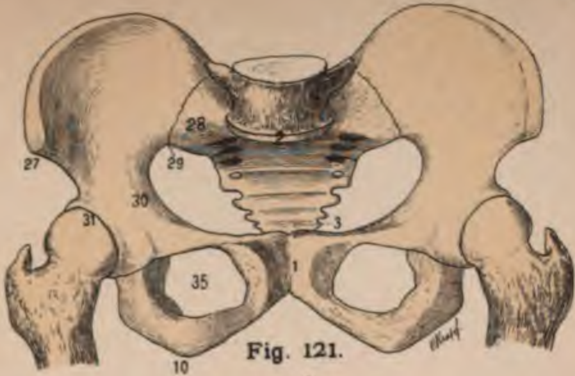

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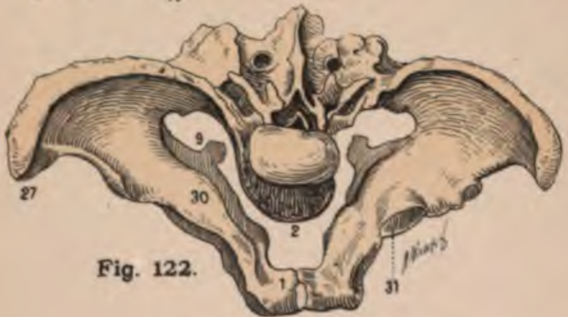

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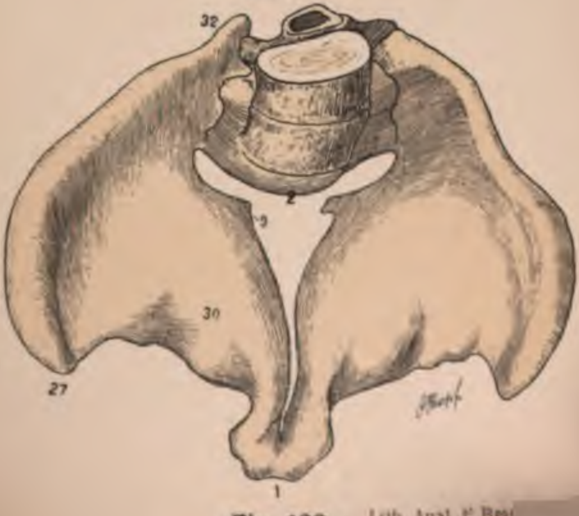

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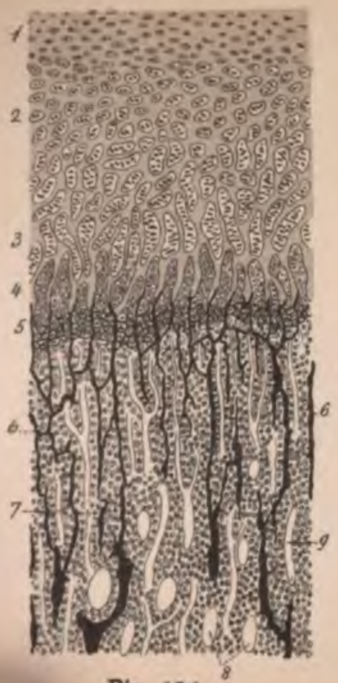

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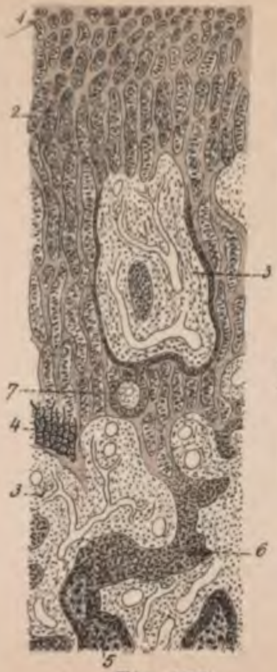

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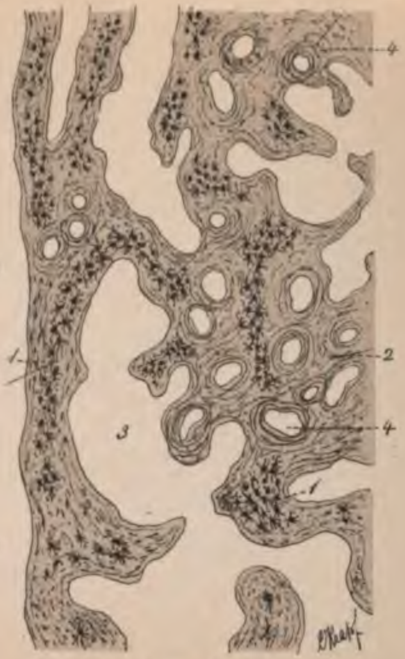


Fig. 126.

Lith. Anst F. Reichhold, München.

less than 2¾ or 3¼ in. (7 or 8 cm.). If, under the same conditions, the head has entered the pelvis and is immovable, the forceps should be used. Embryotomy is indicated if the true conjugate is not less than 2⅝ or 2¼ in. (6.5 or 5.5 cm.) (see § 20, No. 2*a*, foot-note). If the contraction surpasses this limit it constitutes an absolute indication for Cesarean section.

§ 19. ANATOMICAL AND OBSTETRICAL PECULIARITIES OF DEFORMED PELVES.

FIG. 50 (Plate 25). Generally equally contracted pelvis (text, § 20, No. 1).

FIG. 118. Flat non-rachitic pelvis (text, § 20, No. 2*a*).

FIG. 119. Flat rachitic pelvis (text, § 20, No. 3*a*).

FIG. 120. Generally contracted flat rachitic pelvis (text, § 20, No. 3*b*).

FIG. 121. Flat rachitic pelvis of high degree (text, § 20, No. 3*a*).

FIG. 122. Compressed rachitic pseudo-osteomalacic pelvis (text, § 20, No. 3*c*).

FIG. 123. Compressed osteomalacic pelvis (text, § 20, No. 4).

FIG. 124. **Zone of Ossification in a Normal Epiphysis** (microscopical): 1, hyaline cartilage; 2, zone of beginning proliferation of the cartilage; 3, columns of cartilage-cells arranged in rows; 4, columns of enlarged cartilage-cells; 5, first zone of calcification; 6, layer of osteoblasts in first zone of ossification; 7, fully developed cancellous tissue (spongiosa); 8 and 9, blood-vessels in transverse and longitudinal section.

FIG. 125. **Zone of Ossification in a Rachitic Epiphysis** (microscopical): 1, transition of normal hyaline cartilage to proliferating cells: 2, zone of cartilage-cells arranged in rows; 3, cellulofibrous medullary spaces containing blood-vessels in the region of the proliferated and enlarged cartilage-cells; 4, island of calcified cartilaginous tissue; 5, columns of osteoid and fully developed calcified bone-tissue; 6, columns of osteoid tissue not containing lime-salts; 7, like 3, with the blood-vessel in transverse section.

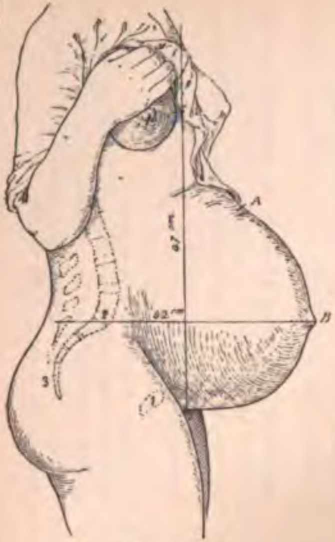
FIG. 126. **Microscopical Section through an Osteomalacic Bone**: 1, remains of calcified bone-substance; 2, decalcified bone-substance; 3, large medullary spaces due to the disappearance of bone-substance; 4, Haversian canals (text, § 20, Nos. 3 and 4).

FIG. 127. **Conical Abdomen** (Spitzbauch), showing the area of dulness (from a case of polyhydramnion of Küstner).

FIG. 128. **Pendulous Abdomen**, first degree.

FIG. 129. **Pendulous Abdomen**, second degree (§§ 15*c*, 20, Nos. 3 and 4).

FIG. 130. **Cephalic Presentation** at the brim in a flat rachitic pelvis in Nägele's obliquity. Second vertex presentation, or presentation of the anterior parietal bone (text, § 20, No. 3).



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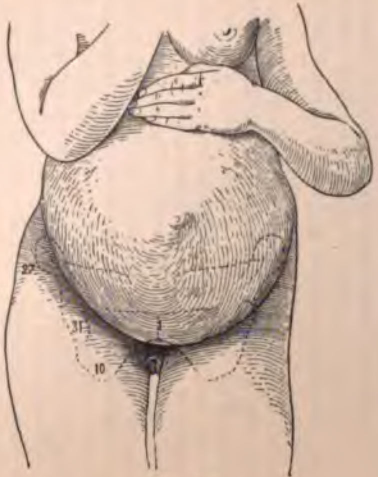

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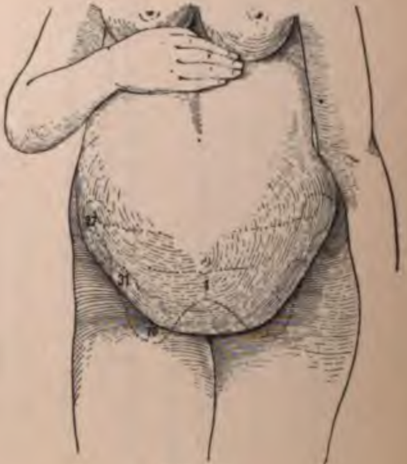

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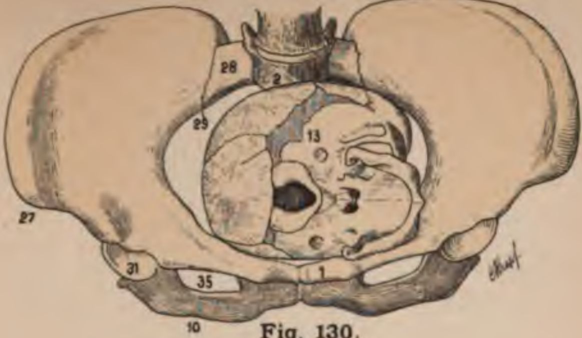

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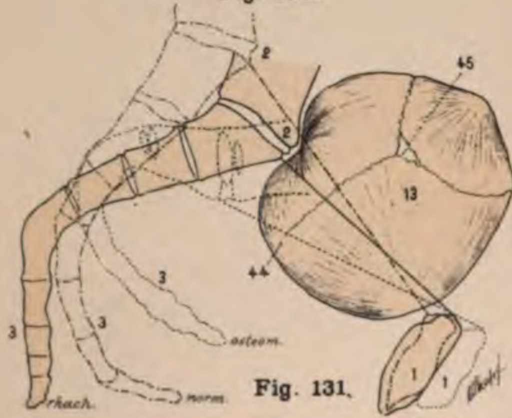

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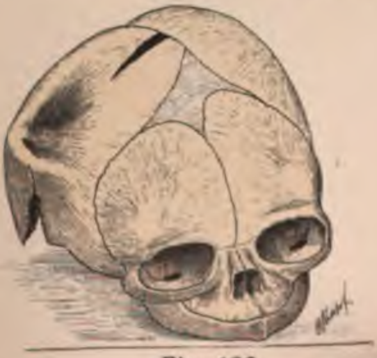

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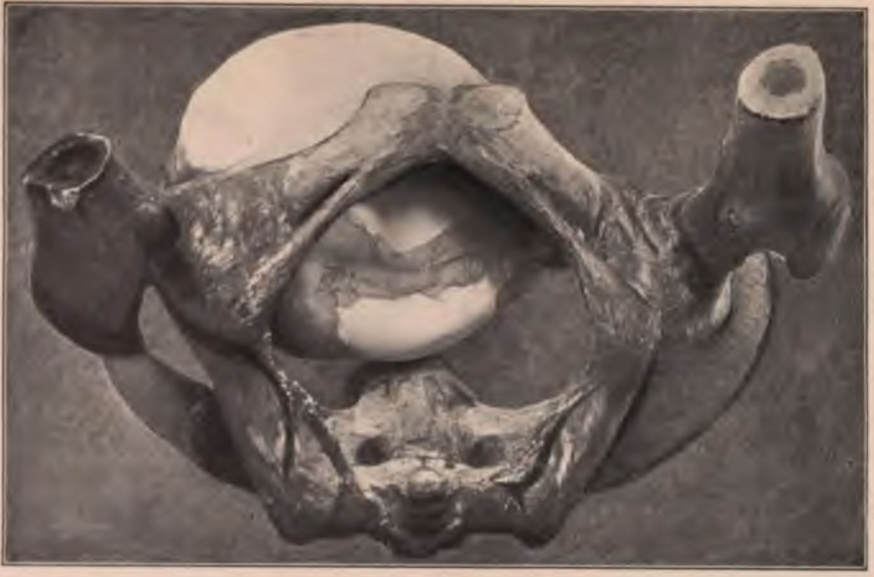

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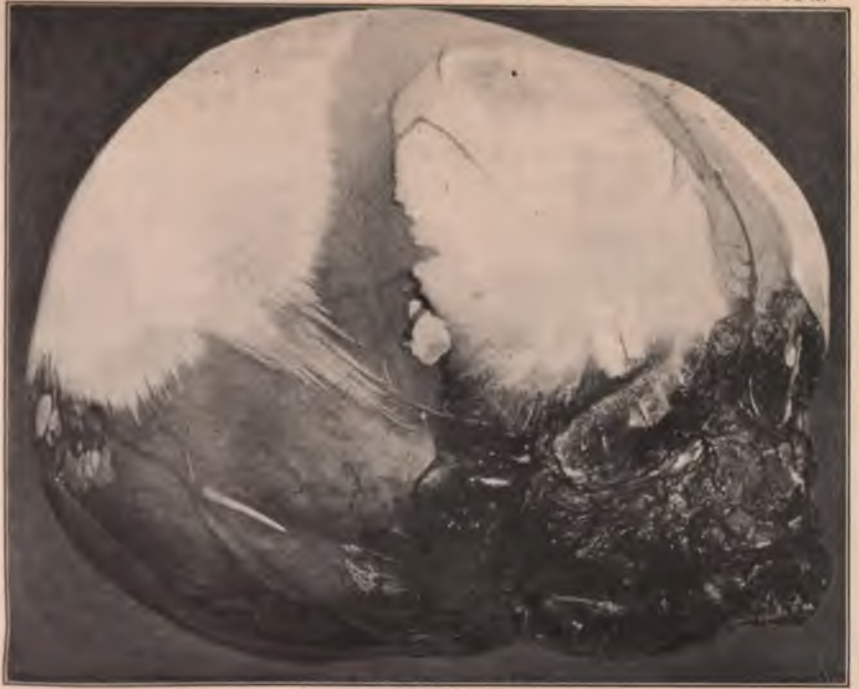

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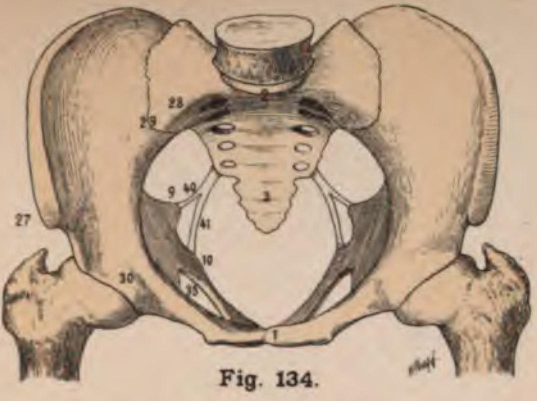

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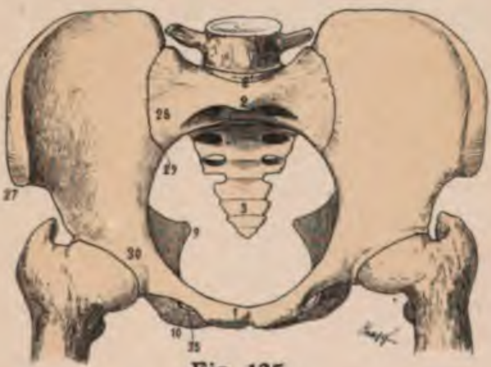

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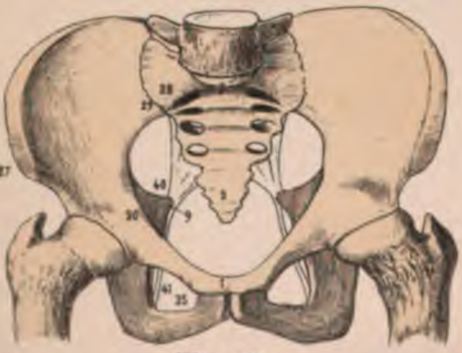

Fig. 136.

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FIG. 131. **Diagram Showing the Curve of the Sacrum** in normal, rachitic, and osteomalacic pelves, with the changes in the position of the symphysis. Presentation of the head as in the preceding figure, seen in sagittal section in a flat rachitic pelvis (text, § 20, Nos. 3 and 4).

FIG. 132. Shows the **Shape of the Skull** described in Figs. 130 and 131: depression of the posterior parietal bone by the promontory, fractures, characteristic bulging of the anterior left parietal bone (text, § 20, No. 3).

FIG. 133. **Brow Presentation** in a case of hydrocephalus with generally and flat contracted pelvis. Complete rupture of the uterus resulted. The position shown in the figure corresponds to what was found at the autopsy.

FIG. 133*a*. **Hydrocephalus** of Fig. 133.—See, also, illustration of the rupture in Figs. 152 and 153 (text, § 20, No. 1).

FIG. 134. **Infantile or Undeveloped, Funnel-shaped Pelvis,** with oval superior strait and contracted outlet (text, § 20, 5*a*).

FIG. 51 (Plate 25). **A Fetal Undeveloped, "Decubital" Pelvis,** funnel-shaped (text, § 20, Nos. 5*b* and 8).

FIG. 135. **Rachitic-kyphotic, Funnel-shaped Pelvis,** with symmetrical assimilation—so-called "intercalated vertebra"; better, "transitional vertebra," bilateral formation (text, § 20, No. 11).

FIG. 136. **Kyphotic, Funnel-shaped Pelvis,** with double promontory (text, § 20, No. 5*c*).

FIG. 137. **Asymmetrical** assimilation pelvis, not obliquely contracted. The lumbosacral "transitional vertebra" forms part of the sacrum on the left, and part of the lumbar vertebra on the right side (text, § 20, No. 11).

FIG. 138. **Double Promontory in Sagittal Section** (text, § 20, Nos. 5 and 11).

FIG. 139. **Obliquely Contracted Pelvis,** due to rachitic scoliosis (*Sk*): the two lowest lumbar vertebræ indicate the compensatory direction (text, § 20, No. 6*a*).

FIG. 140. **Superior Strait of a Right Obliquely Contracted Pelvis,** the left half representing "dead space" for the passage of the head (text, § 20, No. 6).

FIG. 141. **Right Obliquely Contracted Pelvis,** due to ankylosis of the right hip following coxitis (text, § 20, No. 6*d*).

FIG. 142. **Left Obliquely Contracted Pelvis,** due to synostosis of the alæ of the sacrum on the right side (text, § 20, 6*b*).

FIG. 143. **Spondylolisthetic Pelvis** (text, § 20, No. 10).

FIG. 144. **Robert's Transversely Contracted Pelvis** (text, § 20, No. 7).

FIG. 145. **Flat, Anteroposteriorly Contracted Pelvis,** due to luxation of both femora backward and upward (after Schauta—text, § 20, No. 8).

FIG. 146. **Transversely Contracted Oval Pelvis,** due to double talipes varus (after Schauta—text, § 20, No. 8).

FIG. 147. **Split Pelvis or Pelvis Fissa** (after Schauta—text, § 20, No. 9).

Fig. 148. **Acanthopelys** (spiny pelvis) in rachitis; at the iliosacral articulation on the right (29) and at both iliopubic synostoses (30) (text, § 20, Nos. 3 and 12).

Fig. 149. **Exostosis** as a result of fracture of the iliac bone (after v. Winckel—text, § 20, No. 4).

Fig. 150. **A Cystic Enchondroma**, seen from above (Behm's case—text, § 20, No. 13).

(Original drawings from preparations in the Munich Gynecological Clinic: 133, 133*a* from the Heidelberg Gynecological Clinic; 150 drawn from a cast; 122 after K. Schröder; 149 after v. Winckel; 124–126 after Ziegler; 145–147 after Schauta).

CLASSIFICATION AND DESCRIPTION OF DEFORMED PELVES.

Generally Contracted Pelves.

No. 1.—**Generally equally contracted pelvis.**—*Varieties:*

No. 1*a*.—*Juvenile pelvis*, seen usually in well-grown individuals (Fig. 50).

No. 1*b*.—*Masculine pelvis*, simple contracted, with heavy masculine bones.

No. 1*c*.—*Dwarf pelvis* (pelvis nana).

Etiology.—Arrest of development, without rachitis.

Characteristics.—These pelves resemble the normal in shape and symmetry; the bones are normal in thickness; they represent, as a rule, a simple miniature of a normal pelvis. In some there is infantile arrest of development.

In the *infantile*[1] (No. 1*a*) the promontory is high and not very prominent, the sacrum straight, and the inclination of the symphysis diminished. On the other hand, the transverse diameters are normal. The distance between the posterior spines is increased.

In the *masculine* pelvis the bones are extraordinarily thick and heavy; the genitalia are often infantile.

In the *dwarf* pelvis the bones are slender and fragile; the proportions are normal; there is a marked lateral curvature of the anterior surface of the sacrum. In the infantile variety the cartilaginous junctions between the

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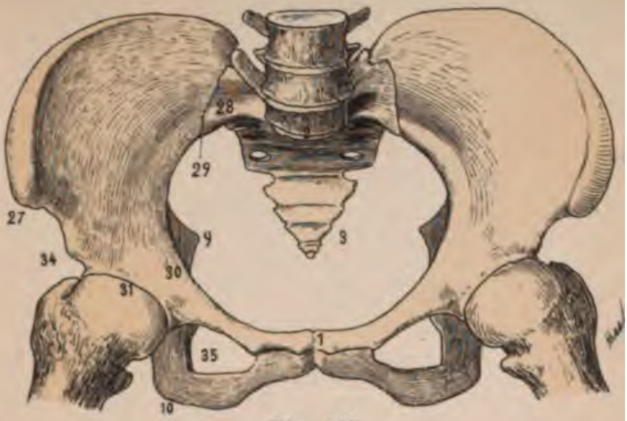
[1] This variety not to be confounded with the "fetal or undeveloped" funnel-shaped pelvis.—Trans.

Tab. 6



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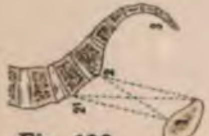

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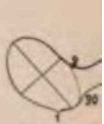

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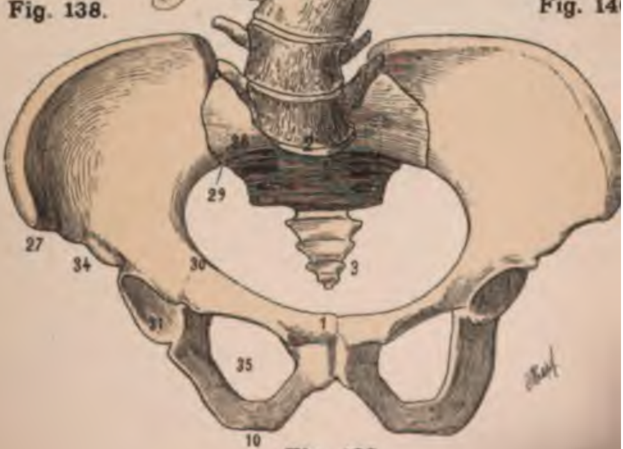

Fig. 139.

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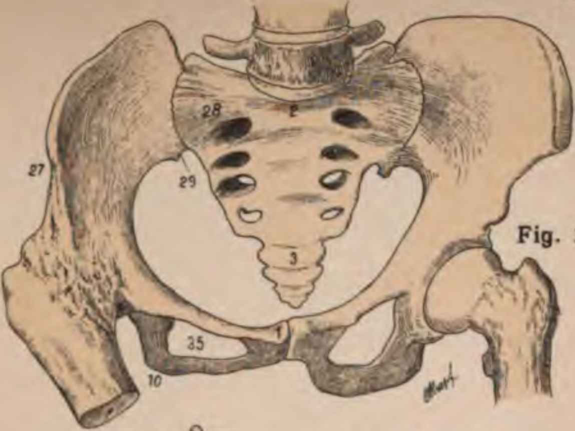

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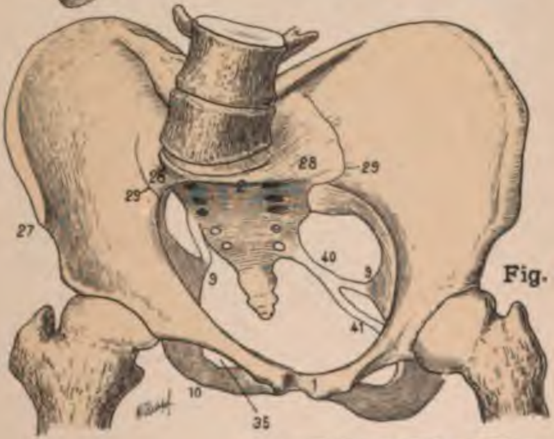

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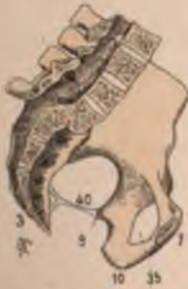

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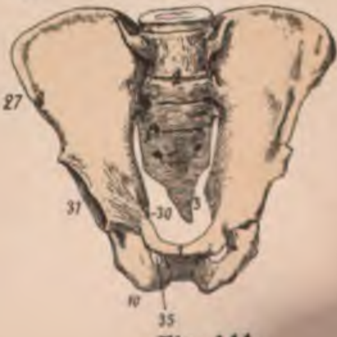

Fig. 144.

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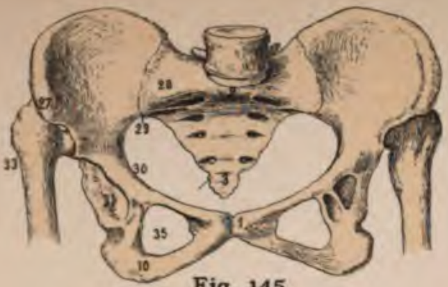

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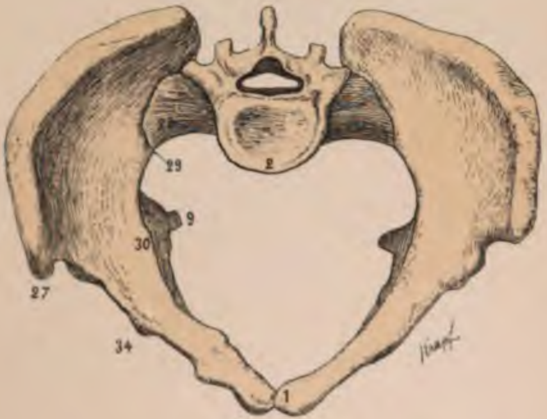

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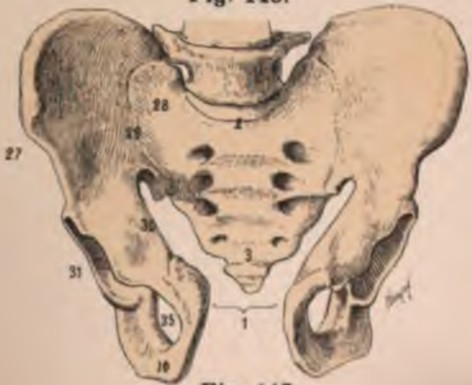

Fig. 147.

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Tab. 66.

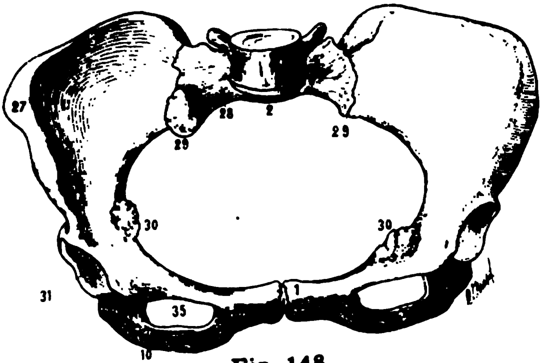


Fig. 148.

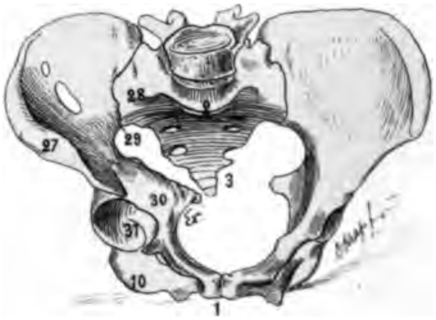


Fig. 149.

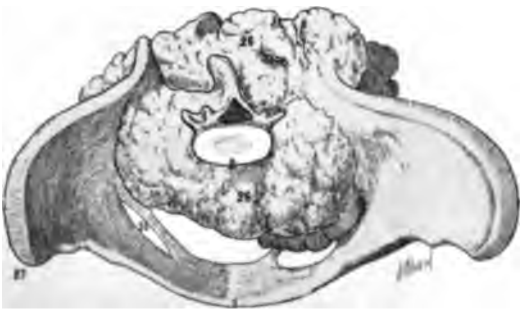
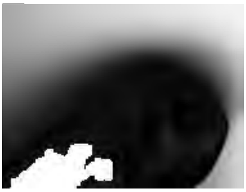


Fig. 150.

Lith. Anst. F. Reichh.



divisions of the sacrum and iliac bones persist. The sacral alæ are narrow in proportion to the body of the vertebra. The promontory is flat. The transverse measurements are normal.

No. 1*d*.—**Generally equally contracted rachitic pelvis.**

Etiology.—Rachitis.

Characteristics.—All the measurements are smaller, especially the distance between the spines. It differs from the *juvenile* pelvis by its angular, unsightly outline (cf. Fig. 50), by the prominence of the crest of the pubis, by the rachitic form and position of the sacrum (see under "Rachitic Pelves"), and by the increasing expansion at the outlet. Probably not so very rare as is usually stated. The relation between the spines and crest is normal; promontory not prominent; diagonal conjugate shortened; distance between the posterior spines increased—hence not rachitic—perimeter of the pelvis about 2¾ in. (7 cm.) less. Even when all the diameters are shortened by ⅘ in. (2 cm.) there is not much more impediment to labor than usual.

Diagnosis.—Conjugata vera between 3¾ and 4¼ in. (9½ and 10½ cm.); never less than 6¼ in. (8 cm.) in juvenile pelves.

Influence on Pregnancy.—Uterine displacements are rare because the lower portion of the fetus succeeds in entering the true pelvis toward the end of pregnancy; hence, also, cephalic presentation is the rule.

Labor.—On account of the uniform resistance encountered at the inlet the chin is brought nearer the chest, in other words, the head is strongly flexed (Röderer's obliquity). This is often combined with Solayrès' obliquity or engagement in the oblique diameter. Advance of the plane (12⅝ in. = 32 cm.) corresponding to the lesser oblique diameter of the fetal skull (3¾ in. = 9.5 cm.); the lesser fontanel can be readily palpated.

Presentation of the greater fontanel (*i. e.*, occipitofrontal periphery—13⅝ in. = 34 cm.—corresponding to the occipitofrontal diameter—4¾ in. = 12 cm.) or of the brow (Fig. 133) is very rare and most unfavorable, especially if the uterus is displaced to the right; hence, in such a case the woman must not be allowed to lie on her right side.

In pelvic presentations, which are rare, the head is delivered in an analogous attitude of flexion.

The progress of the head is very apt to become arrested (paragomphosis); labor-pains soon cease and pressure-necroses result. In rare cases the uterus may be ruptured. Eclampsia is extraordinarily frequent, owing to the pressure on the ureters. Marked caput succedaneum.

Treatment.—If the true conjugate is between 3¼ and 3⅝ in. (8 and 9 cm.) labor should be induced prematurely in the thirty-fifth or thirty-sixth week; or the head may be pressed down firmly on the brim of the pelvis for one and one-half minutes, once a week from the time the child begins to be viable (for size and compressibility of fetal skull, see § 2); or forceps may be applied. If the conjugate measures over 3⅝ in. (9 cm.), an expectant policy may be pursued, the woman being placed on the side toward which the occiput presents. Version is applicable only to exceptional cases. If the fetus is dead embryotomy is to be performed.

TABLE OF INDICATIONS FOR THE INDUCTION OF PREMATURE LABOR.

Conjugata vera 3¼ in. (8 cm.) in the 35th week.
Conjugata vera 3 to 3¼ in. (7½ to 8 cm.) in the 31st to 34th week.
Conjugata vera 3 in. (7½ cm.) before the 30th week.

This applies to flat pelves as well. If the true conjugate is 2½ in. (6 cm.) the induction of abortion is usually necessary.

TABLE OF INDICATIONS FOR THE APPLICATION OF FORCEPS AND FOR EMBRYOTOMY.

Pelvic Contraction.	*Conjugata Vera.*
First degree,	3⅜ to 4 in. (8.5 to 10 cm.);
Second degree,	2⅞ to 3⅜ in. (7 to 8.5 cm.);
Third degree,	2¼ to 2⅞ in. (5.5 to 7 cm.).

With a conjugate of 2⅞ in. (7 cm.) the application of forceps is possible under favorable conditions; 3¼ (8 cm.) is the usual limit.

If the conjugate is less than 2⅝ in. (6.5 cm.) in a generally equally contracted pelvis, or less than 2¼ in. (5.5 cm.) in a flat pelvis, even a mutilated child cannot be extracted.

Spontaneous delivery at term has occasionally been observed in flat pelves with a true conjugate of less than 3¼ in. (8 cm.).

These indications being based on the length of the true conjugate are, of course, influenced by the force of the labor-pains, the possibility of properly preparing the parturient tract, and all the other minor determining factors.

Anteroposteriorly Contracted Pelves.

(Figs. 118–122, 125, 127–132).

No. 2.—**Flat non-rachitic pelvis.**

No. 2*a*.—**Simple flat non-rachitic** (erroneously designated Deventer's) **pelvis** (Fig. 118).

Etiology.—Arrested development. The most frequent pathological form is probably due more to an inherited tendency than to overwork and the carrying of heavy weights in early childhood.

Characteristics.—Shortening of the conjugata vera at the inlet, and, to a lesser degree, of the anteroposterior diameter of the true pelvis; in other words, the sacrum as a whole is displaced forward without rotation around its transverse axis (as in the rachitic) and reduced in size in all its parts. As a result the posterior superior spines project far backward and the distance between them is diminished; the opposite condition obtains in the equally contracted pelvis.

Slight inclination of the sacrum. Often double promontory (Fig. 138). Relation between spines and the crest normal, hence not rachitic. Distance between the posterior superior spines diminished, transverse diameter slightly, external and diagonal conjugates markedly diminished.

In some cases the deformity can be detected with absolute certainty only by Skutsch's method (Figs. 44 and 56).

Influence on Pregnancy.—Pendulous abdomen and abnormal positions and presentations of the fetus are more frequent than in generally contracted pelves.

Labor.—The width of the pelvis being normal, the head engages with the sagittal suture in the transverse diameter of the pelvis and, as it slowly effects an entrance, undergoes two different rotations, as follows:

(*a*) The posterior parietal bone is pushed up toward the promontory, so that the sagittal suture is brought nearer to the promontory (Nägele's obliquity, see Fig. 130).

(*b*) The small bitemporal diameter (3¼ in. = 8 cm.) rotates into the true conjugate, that is to say, there occurs, in addition to Nägele's obliquity or presentation of the anterior parietal bone, a presentation of the greater fontanel, which can be readily palpated. In this transverse position the head descends to the pelvic outlet. In lumbosacral lordosis, especially in rachitic pelves with a high degree of scoliosis and a greatly contracted conjugate, the head enters the brim in extreme flexion (as in the generally contracted pelvis) in the extramedian position (Fig. 140), that is, fixed in one-half of the pelvis.

In breech presentations the prognosis is most favorable when the chin engages first; in other words, the smallest, suboccipitobregmatic periphery (12¾ in. = 32 cm.); otherwise the chin is apt to catch on the horizontal ramus of the pubis.

Diagnosis.—Conjugata vera, 3¼ to 4 in. (8 to 10 cm.), usually more than 3⅝ in. (9 cm.).

In calculating the true conjugate from the diagonal conjugate in flat pelves it must be remembered that the inclination of the symphysis is much less, and hence the diagonal conjugate relatively greater. Instead of ⅗ in. (1.5 cm.), from ¾ to 1¼ in. (1.8 to 3 cm.)—in rachitic pelves—must be subtracted from the diagonal conjugate to obtain the true conjugate.

Treatment.—If the true conjugate is between 3¼ and

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3⅜ in. (8 and 8.5 cm.), induction of premature labor between the thirty-fourth and thirty-sixth weeks, or version *sub partu* is indicated. The forceps is applied only when the head is transversely placed deep in the excavation (hollow of sacrum), or after it has passed the superior strait and the force of the labor-pains is beginning to diminish. In primiparæ it is better to wait, as the head is small and labor-pains are usually vigorous, later, forceps; in multiparæ, version. The unfavorable but rare presentation of the posterior parietal bone should be corrected when the head first enters the inlet; otherwise version, but not forceps. The woman should be placed on the side toward which the brow presents, so as to favor the entrance of the smaller, anterior portion of the head (sinciput) into the inlet.

The danger of rupture of the uterus is greater than in generally contracted pelves.

The treatment mentioned under No. 1, "generally contracted pelves," of forcing the head into the pelvic inlet during the latter part of pregnancy, is useful in this variety of deformed pelvis.

No. 2*b*.—*Generally and flat contracted, non-rachitic pelvis* (generally unequally contracted, non-rachitic pelvis).

Etiology.—Arrest of development.

Characteristics.—Shortening of all the diameters, especially of the anteroposterior at the inlet, due not to anterior displacement of the sacrum, but to the imperfect development of the portions of the innominate bone which surround the inlet. Probably not so very rare as is usually stated. The promontory is very high and displaced backward, hence from ⅘ to 1 in. (2 to 2.5 cm.) must be subtracted from the diagonal conjugate in calculating the conjugata vera.

The *influence on labor* is the same as in the corresponding rachitic form.

No. 3.—**Flat rachitic pelvis.**

No. 3*a*.—**Simple flat rachitic pelvis** (Figs. 119, 121, 125, 127–132).

Etiology.—Rachitis. The proliferation of cartilage and bone-cells is normal, but there is defective deposition of lime salts, or the lime-salts already deposited are absorbed because the blood-vessels in the bone-forming structures are increased in number and overfilled with blood, and thus bring about a more rapid liquefaction of the cartilage and the already ossified tissues (cf. Fig. 124 with Fig. 125).

The effect is twofold: 1. Distortion of the skeleton by pressure and traction, as explained in § 4. The effect is exaggerated on account of the softness of the bones. 2. Infantile arrest of development in the insufficiently nourished bones. Hereditary tendency may be present in some cases.

Characteristics.—The distance between the anterior spines is equal to, or even greater than, the distance between the crests, because the ilia are flattened and pushed backward. This condition of the iliac bones is the result of flattening and of the absolute, or at least relative, increase in the separation of the two iliac bones. Owing to lordosis of the lumbar vertebræ the sacrum sinks forward into the pelvis, the effect of the excessive weight of the trunk in childhood when the rachitic softening process is most active. The posterior superior spines project backward and the distance between them is diminished. There is backward displacement of those portions of the sacrum which articulate with the iliac bones (the first to the third vertebra); the remaining portions of the sacrum and coccyx are straighter than normal (cf. Fig. 13). Like most of the other bones the sacrum is diminished in size. Owing to the pull of the ligaments and muscles there is even a greater increase in the transverse diameter at the outlet. The pubic arch is usually more than 100 degrees. The symphysis is perpendicular and therefore tends to lengthen the diagonal conjugate; in common with the other walls of the true pelvis it is diminished in height. From a practical point of view it is important to note that all the synostoses, synchondroses, and synarthroses, etc., form sharp, projecting, bony points which may easily rupture the soft parts (cf. under "Acanthopelys," § 20, No. 12, and Fig. 148).

Influence on Pregnancy.—There is an extraordinary tendency to uterine displacements: anteversion and anteflexion with pendulous abdomen (see § 15*c* and Figs. 99, 127–129), or retroversion and retroflexion, which may lead to serious incarceration under the promontory (see § 15*a* and Figs. 102, 103, 105). Eclampsia, on the other hand, is rare, probably because the ureters are protected from pressure by their position in the hollow spaces to either side of the convex body of the sacral vertebra. But for this very reason there is a greater predisposition to prolapse of an extremity or of the umbilical cord (five times more frequent). Owing to the length of time consumed in overcoming the difficulties at the inlet or to an abnormal presentation an excessive amount of amniotic fluid is produced, and rupture of the membranes usually occurs prematurely, that is, before engagement of the head in the superior strait; in 56 per cent. of the cases it occurs only after the os is fully dilated. The head engages in the same way as in the flat non-rachitic pelvis, which has been described (cf. preceding form, 2*a*, Figs. 130–132). The muscular effort is usually much greater, and the danger of rupture of the soft parts or of the pelvic joints, especially at the sharp projections described, correspondingly increased (see § 20, No. 12, and Fig. 148). Great liability to localized necrosis and fistula formation. Vertex presentations are less frequent by 10 per cent.; the duration of labor is increased by 50 per cent. Caput succedaneum very pronounced; the outline of the entire skull suffers a corresponding degree of disfigurement and injury; the posterior parietal bone, which is forced against the promontory, receives an indentation, or even a fracture, and subdural hematomata are formed (Figs. 130–132). Labor-pains are irregular, both on account of the purely mechanical resistance and indirectly on account of circulatory disturbances.

Diagnosis.—Conjugata vera is usually above 3¼ in. (8 cm.) (cf. tables and remarks under No. 1, generally contracted pelves). General rachitic habit. Flat receding iliac bones. The distance between the anterior superior spines is equal to, or greater than, the distance between the crests; the promontory is easily palpated. External and diagonal conjugates are shortened; from ¾ to 1¼ in. (1.8 to 3 cm.) must be subtracted in calculating the conjugata vera. The descent of the promontory may also be inferred from the prominence of the posterior superior spines and the diminution in the distance between them.

Treatment.—The same as for flat non-rachitic pelves. It is to be remembered that owing to the perpendicular position of the symphysis the difference between diagonal and the true conjugate is greater (⅘ in. = 2 cm.) than it is in non-rachitic pelves. The measurements of the outlet are to be taken into account, as has been explained under No. 5; in certain cases the perforator may be required instead of the forceps.

No. 3*b*.—**Generally contracted, flat rachitic pelvis** (Fig. 120).

Etiology.—Rachitis. The softer the bones and the earlier the disease makes its appearance, the deeper and more anterior is the position of the body of the first sacral vertebra, the greater the compression of the lateral walls of the pelvis in front by the femora, and the more imperfect the development of all the bony parts.

Characteristics.—Transitional form between the simple flat rachitic and the collapsed "pseudo-osteomalacic pelvis," inasmuch as it owes its shape to an earlier and more intense softening process than to that which produces the "simple flat rachitic pelvis," and has, therefore, suffered a lateral compression in addition to the flattening, the compression being greater in the transverse direction than in the conjugate on account of the pressure of the femora. The result is a triangular shape (Fig. 120) of the inlet; in other respects it bears all the marks of a "simple flat rachitic pelvis" in contradistinction to the rarer non-rachitic, generally equally, and flat contracted pelves. The outlet, however, is smaller, hence also the distorting effect of the muscles and ligaments which is seen even in the flat pelvis is greater: the psoas and sacrospinal muscles act on the lumbar lordosis and on the upper portion of the sacral bone, which they tend to straighten; the iliosacral bones counteract the outward rotation of the iliac bones.

Influence on Pregnancy.—The promontory projects far into the pelvic cavity, leaving a greater amount of "lost" (dead) space on either side for the uterus and its contents, but the anterior half of the pelvis available for this purpose has the same special characteristics as the "generally equally contracted pelvis," hence there is an extraordinary tendency to anteflexion with pendulous abdomen (Figs. 99 and 129), abnormal positions and presentations of the fetus, and anomalies in the shape of the uterus (transversely elliptical, round, or obliquely distorted).

Labor.—The head in this variety also engages with the sagittal suture in the transverse diameter of the inlet; eventually the occiput descends as in the generally contracted pelvis, the posterior parietal bone usually presenting. Presentation of the anterior parietal bone is very unfavorable. Rotation around the small oblique diameter occurs very late.

In pelvic presentations the chin is the first to enter the inlet, the head, therefore, passes in this case also in the smallest or suboccipitobregmatic periphery (12¾ in. = 32 cm.); any other mechanism is most unfavorable. Prolapse of an extremity or of the cord is readily explained by the "lost (dead) angles" on either side of the promontory. There is great liability to rupture, both of the soft parts and of the pelvic joints; marked caput succedaneum; injury to the parietal bone by the promontory (subcutaneous and subdural hematomata, Figs. 130–132), the result of the extraordinary duration of labor and the triangular shape of the inlet so ill adapted to the fetal skull (Fig. 120).

Diagnosis.—Conjugata vera often less than 3¼ in.

(8 cm.) (see tables and remarks under No. 1, generally contracted pelves).

The general signs of rachitis are more marked; the stature is small. All the signs of a simple flat rachitic pelvis and, in addition, shortening of all the transverse diameters, even those of the outlet, are present. The iliopectineal line can be readily palpated.

Treatment.—If the true conjugate measures 3¼ to 3⅝ in. (8 to 9 cm.) premature labor should be induced between the thirty-second and thirty-sixth weeks; or, if the posterior parietal bone presents and the occiput has descended into the hollow of the sacrum, the forceps may be used. In presentation of the anterior parietal bone usually, and if the true conjugate is less than 3¼ in. (8 cm.), always, craniotomy or Cesarean section is called for.

In primiparæ with only a moderate degree of contraction it is advisable to defer the induction of premature labor until the thirty-eighth or fortieth week (Ahlfeld).

Collapsed Pelves.

(Figs. 122, 126, 128.)

No. 3c.—*Collapsed rachitic* or *pseudo-osteomalacic pelvis* (Fig. 122).

Etiology.—Rachitis. When the bones are very soft and the already formed layers of lime-salts undergo secondary liquefaction, the acetabula and promontory, being most exposed to pressure and traction, show the effect of compression most markedly. The symphysis is protruded in the form of a beak, while the iliac bones are bent backward.

Characteristics.—The inlet resembles that of the osteomalacic pelvis, being shaped like a heart in cards. Marked descent of the promontory; inward compression of the acetabula and beak-like prominence of the symphysis. The small iliac bones are flat and displaced backward. The tuberosities of the ischium are approximated.

Influence on Pregnancy.—During pregnancy the position of the uterus is high, from failure of the presenting part to enter the superior strait, oblique positions of the fetus arise, etc.

Labor.—Spontaneous and forceps delivery are equally impossible in most cases.

Diagnosis.—Extraordinarily deep position of the promontory; the symphysis is beak-shaped; the characteristic outline of the iliopectineal line is readily palpable. Manifestations of rachitis are present. The real conjugata vera is no criterion for the possibility of labor.

Treatment.—Cesarean section is required in almost every instance.

No. 4.—**Osteomalacic collapsed pelvis** (pelvis halisteretica, Fig. 123).

Etiology.—Osteomalacia. The lime-salts in the perfectly developed bone of the adult undergo absorption and are not replaced by cartilage as in the child; nothing remains but the fibrous tissue devoid of lime-salts (Fig. 126). In contradistinction to rachitis there is here an inflammatory process, accompanied by decalcification and dilatation of the Haversian canals and medullary spaces; the calcified bone-substance containing bone-cells is replaced by lamellar connective tissue, hence the flexibility of the osteomalacic pelvis (osteitis *plus* osteoporosis).

Characteristics.—As the bones of the pelvis begin to soften, the transverse diameter is diminished, the alterations beginning in the anterior pelvic wall in response to the pressure of the femora. Later the characteristic alterations just described for the pseudo-osteomalacic rachitic pelvis make their appearance, and the most severe grades of deformity and compression result, so that even digital exploration *per vaginam* becomes impossible on account of the approximation of the tuberosities of the ischium. The pubic arch disappears or assumes an octagonal shape. The central portion of the sacrum is also markedly displaced upward and backward, but—in contradistinction to the rachitic pelvis (cf. Fig. 141)—the tip of the coccyx projects forward so that the sacrococcygeal curve is greatly increased and the outlet markedly contracted in the anteroposterior diameter. The iliac bones present a deep furrow running from the iliosacral articulation obliquely upward and forward to the crest or to the anterior spines ("sulcus iliacus"). The incomplete fractures which are frequently seen are due to softening of the medullary portion of the bone, while the shell remains intact. The so-called "rubber pelves," finally, are absolutely soft and yielding.

Characteristics.—The course of labor depends solely on the degree of softening. If the disease has been cured the pelvis is set in its pathological shape and spontaneous labor is impossible. For this reason a careful examination should be made during pregnancy to determine whether there is retroflexion and incarceration of the uterus (see § 15*a* and Figs. 102, 103, 105). Acute signs of osteomalacia must be looked for, such as pains in the bones (beginning in the horizontal rami of the pubis), muscular cramps, compressibility of the bones (beginning at the outlet), and especially the peculiar waddling gait. In many cases, given variously as from 17 to 80 per cent., spontaneous labor is possible if the flexibility of the bones is such as to permit distention of the pelvic canal; if not, Cesarean section is usually the only possible procedure. Whether the ovaries should be removed or a complete Porro amputation performed at the same time, with the view of curing the disease, is still an open question which need not be discussed in this place. In some cases the induction of premature labor might be considered.

For the rest, the shape and size of the interior of the pelvis should be carefully investigated.

The *diagnosis* of the osteomalacic pelvis based on the presence of a transverse fold in the skin above the pelvis, the beak-like shape and upward displacement of the symphysis, the contraction at the pelvic outlet, and the diminution in the intertrochanteric distance (see § 3).

Treatment.—During labor the distention of the "lower uterine segment" must be carefully watched, as rupture is very apt to occur. Excessive distention of the lower uterine segment is a contra-indication for version. If the pelvis is flexible the application of forceps may under favorable conditions be considered. Craniotomy is rarely called for; Cesarean section is the usual procedure.

Funnel-shaped Pelves (see § 20, No. 11).

(Figs. 51, 134–136, 138.)

No. 5.—**Funnel-shaped pelvis, generally or anteroposteriorly contracted at the outlet.**

Etiology.—The pelvic outlet may be contracted in generally and in flat contracted pelves, in spondylolisthesis, osteomalacia, and in bilateral synostosis (cf. Nos. 4, 6*b*, 7, 10).

No. 5*a*.—**Infantile or undeveloped pelvis** (Fig. 134).

Etiology.—Arrest of development; abnormally high position of the promontory with flattening of the sacrum, perhaps with early, although not necessarily abnormal ossification, whereby the character of the infantile pelvis is retained and the weight of the trunk is applied more posteriorly, so that transvere enlargement of the pelvis becomes impossible, etc.; in other words, an accentuation of the infantile properties.

Characteristics.—Contraction chiefly and most frequently in the transverse diameter of the outlet (Fig. 43, § 3); then in the conjugate of the outlet; frequently all the diameters of the pelvic outlet are diminished. Moderate diminution in the transverse diameter[1] of the outlet is an obstacle to labor only when all the segments forming the outlet are contracted, or when there is anterior luxation and fixation of the coccyx.

The rest of the spinal column is normal; even the form and position of the sacrum[2] and promontory are sometimes quite normal, the greatest contraction is found at the outlet, especially in the transverse diameter, the true pelvis itself being rather high.

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[1] A very good instrument for the measurement of the transverse diameter of the outlet has been devised by Klien (Dresden).

[2] The sacrum is long and narrow and usually shows only a slight inclination, but this is not due to an increase in the transverse and decrease in the longitudinal curvature, as Schauta found, since it also

Influence on Pregnancy.—The pelvic inlet being normal, round, or oval, with the long axis in the anteroposterior plane and only a slight degree of contraction, the presenting part regularly enters the true pelvis and there is no tendency to uterine displacements, etc.

Labor.—As labor progresses the presenting part meets with serious resistance, for it cannot move in any direction. The normal rotation into the anteroposterior diameter takes place in the line connecting the spines of the ischium (§ 7); the shortening of this line, which represents the smallest diameter, and of the distance between the tuberosities prevents this rotation. The head, for instance, is arrested with the sagittal suture in the oblique or in the transverse diameter, *i. e.*, the largest diameter of the head coincides with the smallest diameter of the pelvis, while the occiput often slips past the spine of the ischium into the posterior portion of the excavation. But by the time the head has reached the spines of the ischium, after passing through the pelvic inlet, the greater part of the trunk has escaped from the fundus, which is the only portion of the uterus capable of contraction, and the expulsive forces come to a standstill. While the danger of rupture from distention of the lower uterine segment is slight, pressure-necrosis in the vagina and vesicovaginal and urethrovaginal fistulæ are very apt to result.

Diagnosis.—The transverse diameter of the outlet, or, in other words, of the plane of pelvic contraction and the

occurs in pelves with a high promontory and a flat sacrum. In such cases it is due to the greater height of the body of the first sacral vertebra over the ala, thus converting the transverse diameter into two lines running downward. The pelvic inlet is usually round with a tendency to the ovoid shape, the result of the anomalies in the sacrum; it is higher than normal and more concave from side to side, while the insertion of the innominate bones is situated more anteriorly. The inclination of the pelvis is a little greater than normal, the symphysis somewhat more perpendicular—in short, the pelvis presents infantile characteristics.

conjugate of the outlet, are found to be diminished (Fig. 42, § 3), while the measurements of the false pelvis are normal, especially those of the pelvic inlet. The tip of the coccyx is easily palpated. The limits which permit the delivery of a full-grown, vigorous child at term are as follows: Distance between the tuberosities of the ischium 3¼ in. (8 cm.; normal: about 4 in. = 10 cm.) if the other measurements of the outlet are normal, or the distance between the tuberosities is 3⅜ to 3⅝ in. (3.5 to 9 cm.), and the distance from the tuberosities to the tip of the coccyx only 2¾ in. (7 cm.; normal: 3¾ in. = 9.75 cm.), or the conjugate of the plane of contraction under 3⅝ in. (9 cm.; normal: 4½ in. = 11.5 cm.). If the shape and position of the sacrum are normal and the pelvic outlet is funnel-shaped, we have to deal with a simple infantile arrest of development.

Treatment.—In moderate grades of contraction inaction, and later, forceps. If, however, the distance between the tuberosities is 3¼ in. (8 cm.), or the conjugate of the plane of pelvic contraction under 3⅝ in. (9 cm.), craniotomy, or, possibly, symphysiotomy or Cesarean section, is the only treatment. Particular care is necessary in the use of the forceps, on account of the great danger of extensive contusions or of separation of the pelvic joints. If the distance between the tuberosity and the tip of the sacrum is reduced to 2¾ in. (7 cm.) the forceps may be employed only when the distance between the tuberosities measures at least 3⅜ in. (8.5 cm.), always provided that we are dealing with a skull of normal strength belonging to a matured fetus. If the measurements fall below this limit, and a living child is desired, symphysiotomy or Cesarean section must be done; the former operation to be followed by the application of forceps down to 2¼ in. (5.5 cm.) as the limit for the distance between the tuberosities. A transverse presentation is always to be converted into a cephalic presentation; version is not permissible. The induction of premature labor in the thirty-fourth week may be considered if the distance between the tuberosities is not less than 2⅝ in. (6.5 cm.—from 2¼ to 2⅝ in. = 8 cm. to 6.5 cm.).

No. 5*b*.—*Fetal, undeveloped decubital pelvis* (Fig. 51).

Etiology.—Prolonged confinement in bed with absolute inability to move or sit up.

Characteristics.—The spinal column is almost as straight as in the fetus, so that the sacrum is practically the continuation of the axis of the vertebral column; the promontory is high and projects very little. The inclination of the pelvis is considerable, although the physiological anteflexion does not take place; on the other hand, the rotation described in § 4, No. 2, does not take place either, and thus the anterior pelvis is not elevated.

There is no transverse expansion and the sacrum remains narrow and straight, the iliac bones continue flat and small. The pelvic inlet is round or ovoid and the true pelvis distinctly funnel-shaped. The genitalia themselves do not develop and there is no record of a woman with such a pelvis having given birth to a child.

No. 5*c*.—**Lumbosacrokyphotic funnel-shaped pelvis** (Figs. 135 and 136).

Etiology.—Rachitis or caries in the lumbosacral or lumbodorsal region.

Characteristics.—The kyphotic lumbar vertebræ draw the first sacral vertebra backward and upward, so that the promontory is flattened and displaced upward. In order to maintain the equilibrium the anterior portion of the pelvis has to be raised and the pelvic inclination is therefore diminished. In this position the sacrum does not support the weight of the trunk to the normal extent and is, therefore, unable to effect transverse expansion. The posterior superior spines become approximated, the innominate bones are flattened because the iliosacral ligaments are relaxed on account of the failure of the sacrum to descend and draw them forward. On the other hand, the lower arms of the lever—the iliac and ischiatic bones—become approximated; *i. e.*, the transverse diameter of the outlet is shortened. In addition, the tip of the coccyx is rotated forward and thus tends to increase the contraction at the outlet. The diminished transverse concavity, which may even go on to convexity of the sacrum, and the wide separation of the iliac bones are the only signs of rachitis.

Influence on Pregnancy.—There is a tendency to pendulous abdomen on account of the lordosis of the upper portion of the vertebral column, and consequent diminution in the size of the abdominal cavity.

Labor.—Longitudinal position of the fetus is the rule, the largest diameter of the presenting part usually adapting itself to the oblique diameter of the pelvis.

Course and *treatment* are the same as for infantile funnel-shaped pelves.

Diagnosis.—The time at which the vertebral disease occurred is ascertained and the probable influence on the development of the pelvis determined. The iliac bones are widely separated, the symphysis projects, the pelvic inclination is diminished. The pubic arch and the diameters of the outlet are contracted. In contradistinction to spondylolisthesis the lateral portions of the iliopectineal line is easily reached with the palpating finger, while the promontory is almost or quite beyond its reach.

No. 5*d.*—*Pelvis obtecta*, spondylolisthesis in the lumbar region.

Etiology.—The same as in the preceding, but the kyphosis is compensated by marked lordosis of the lowest lumbar vertebræ.

Characteristics.—The kyphosis is compensated immediately above the pelvic inlet by the projection of the lowest lumbar vertebræ, thus forming a pelvis obtecta, resembling the spondylolisthetic pelvis.

The *influence on labor* is the same as in the preceding pelvis.

No. 5*e.*—**Kyphoscoliotic funnel-shaped pelvis.**

Etiology.—Rachitis.

No. 5*f.*—*Pelvis with contracted outlet due to luxatio and ankylosis of the coccyx.*

The *characteristic* sign is the involvement of the sacrum in the kyphoscoliosis. On the side of the scoliosis the pelvic inclination is very slight (usually the left side); on the other, it is quite marked. This oblique distortion is combined with the funnel shape of the true kyphotic pelvis. At the outlet the distortion is reversed. (For further description see under scoliotic obliquely contracted pelvis, No. 6*a*.)

Obliquely Contracted Pelves.

(Figs. 139-142.)

No. 6.—**Obliquely distorted or contracted pelvis.**

No. 6*a*.—**Obliquely contracted pelvis due to scoliosis or lordoscoliosis** (Figs. 139 and 140).

Etiology.—Rachitis. The "non-rachitic" acquired form of kyphoscoliosis does not produce any alteration in the shape of the pelvis. The weight of the trunk presses more heavily on the side corresponding to the scoliosis, so that the ala of the sacrum on that side is pushed inward. The counter-pressure of the femur on the innominate bone produces an oblique distortion of the opposite half of the pelvis. If scoliosis is combined with kyphosis a torsion of the vertebræ is produced in a direction opposite to that of the scoliosis. The resulting abnormal pull on the ilio-sacral ligaments draws the venter of the ilium in the same direction. This traction, combined with the counter-pressure of the femur, pushes the ilium and the entire half of the pelvis corresponding to the scoliosis upward, producing a vertical position of the pelvis with the anterior margin of the venter of the ilium nearer the median line.

Characteristics.—The oblique distortion takes place either in the direction opposite to that of the undeveloped ala; *i. e.*, in the sagittal plane of the last lumbar vertebra, or in the direction corresponding to the diseased hip-joint. The lumbodorsal scoliosis is compensated by the oblique contraction of the pelvis, the compensation being effected either by scoliosis of the sacrum alone to the opposite side, or by rotation of the last lumbar vertebra. In general, the direction of the latter indicates the direction of the oblique contraction, and on this side the ala of the sacrum will be found imperfectly developed and the iliac bones perpendicular or even inclined inward; the corresponding half of the pelvis is higher than the other half and the curve of the iliopectineal line is diminished: hence, 1, the true conjugate is shortened; 2, the distance between the alæ of the sacrum is diminished on the same side; and, 3, the oblique diameter from the sacro-iliac articulation on the same side is lengthened. The tuberosity of the ischium on the side of the scoliosis usually projects outward, so that the transverse diameter of the pelvic outlet is increased (Fig. 139). For the rest, we have all the signs of the rachitic pelvis.

The *diagnosis* is based on the general signs of rachitis and on the age at which the disease first made its appearance. The pelvis shows all the general characteristics of rachitis, and the oblique contraction is determined by palpation, by measuring the height of the crests in relation to the costal margin, and by determining the degree of torsion of the vertebral column. If the obliquity is very marked, it will show itself in a difference between the two external oblique diameters (§ 3); the more marked these differences are, in the following measurements of Nägele and others, the more certain is the diagnosis of even a mild grade of oblique contraction; no one pair of oblique diameters is in itself sufficient to establish the diagnosis. The first four give the most reliable results both in the skeleton and in the living subject (author's own measurements):

(1) The external diagonal of the false pelvis = 9 in. (22.5 cm.) on the average *in viva.*

(2) The width of the iliac bone (posterior superior spine to anterior superior spine) = 6⅝ in. (16.8 cm.) on the average *in viva.*

(3) The distance between the anterior superior spine to

the crests on the two sides is determined. The iliopectineal line must be palpated with great care and the distances between the symphysis and the synostosis carefully measured to obtain the conjugate. If this distance is 3⅜ in. (8.5 cm.) or more, premature labor may be induced. The oblique diameter is to be measured as in the last-mentioned pelvis.

Influence on Labor.—The available space during labor has the characteristics of a generally contracted pelvis with a triangular inlet, the conjugate of which corresponds to the line joining the symphysis and the iliosacral synostosis. The head is therefore in extreme flexion and presents with the occiput; if the sacrocotyloid distance is very much diminished the same remarks apply as in the preceding pelvis. The contraction at the outlet presents serious difficulties; even in vertex presentations the prognosis is unfavorable, in any other it is distinctly bad.

Treatment.—The application of the forceps can only do harm and version is of no avail, because the head cannot pass. The choice, therefore, lies between the induction of premature labor, craniotomy, and Cesarean section. (For moderate grades of contraction, especially at the outlet, see Funnel-shaped pelvis, No. 5*a*.)

No. 6*c*.—*Obliquely contracted pelvis due to primary inflammatory synostosis of one sacro-iliac joint.*

Etiology.—Caries. The synostosis is primary. The shape of the pelvis depends on the date of the disease.

Characteristics.—A variety of forms occur, ranging from the highest degree of asymmetry, as in Nägele's congenital obliquely contracted pelvis (due to secondary synostosis), to a perfectly symmetrical form, and including intermediate varieties due to disease in early childhood.

The *diagnosis* is based on the history of former inflammatory process, the presence of scars, and the absence of displacement of the diseased innominate bone.

No. 6*d*.—**Obliquely contracted pelvis due to impaired function of the hip-joint** (Fig. 141).

Etiology.—Coxalgia; unilateral congenital luxation of the femur; early amputation, etc.; comminuted fracture of one innominate bone or of one sacral ala (Fritsch).

All the bony parts of the diseased pelvic half from the tuberosity of the ischium to the crest undergo atrophy. The pelvis becomes perfectly perpendicular and assumes the characteristic funnel shape (like the diseased side of a synostotic pelvis). Owing to the pressure of the sound thigh the corresponding half of the pelvis is pushed over toward the diseased side, so that the sound half becomes flattened; the acetabulum on the diseased side may be perforated.

In the rarer form of simple coxalgia without the effects of the pressure of the thighs the diseased half undergoes contraction as in the synostotic pelvis, the sacral ala becoming atrophied, whereas in the former variety atrophy usually but not always occurs on the sound side, so that the sacrum is rotated on its longitudinal axis.

In contradistinction to Nägele's pelvis the oblique oval form observed at the inlet does not maintain the same direction as the outlet is approached, because the ischiatic portion on the sound side is forced outward, or because the forward and outward displacement of both tuberosities of the ischium tends to diminish the contraction toward the outlet.

Influence on Labor.—Luxation of one femur (usually backward and upward) produces various forms, depending on the age of the individual and use of the legs.

(*a*) *Congenital Luxation.*—When the child is lying down the diseased half of the pelvis atrophies; the iliac bone is perpendicular on account of the pressure of the thigh against its outer surface; the tuberosity of the ischium is drawn up by the muscles attached to the trochanter. The child sits on the diseased tuberosity because it is the higher of the two, and this leads to oblique contraction of the pelvis in favor of the sound side. In walking the child throws its weight chiefly on the sound thigh, hence the pressure is now applied to the sound

Talipes varus on both sides. The leg is moved as if it were rigid; posterior displacement of acetabulum and tuber ischii. Marked pelvic inclination.

Characteristics.—As the center of gravity is displaced backward the lumbosacral portion and the sacrum are forced downward between the innominate bones either in front or behind: the promontory and tip of the coccyx project, while the central portion of the sacrum recedes. The transverse diameter as well as the inclination of the entire pelvis is increased, while the true conjugate is diminished; the iliac bones are perpendicular.

Diagnosis.—Waddling gait, pendulous abdomen due to the lumbar lordosis and shortening of the true conjugate; the pelvis is very wide; the trochanters come in relation with the outer surface of the iliac bones so that they are not touched by Nélaton's line (anterior superior spine to tuberosity of the ischium); the thighs are adducted and rotated inward. The differential diagnosis from spondylolisthesis is based chiefly on accurate measurements and the relation to Nélaton's line.

Influence on Pregnancy.—Pendulous abdomen.

Labor.—The indications for operative interference are the same as in the flat pelvis. At first inaction, as the great transverse expansion and shallowness of the pelvis often lead to precipitate delivery. Operations are difficult to perform on account of the extreme adduction of the thighs.

Double talipes. As a result of the backward displacement of the acetabulum and tuberosity (see Etiology) the pelvic inclination is markedly increased, the promontory is low and prominent, and the entire pelvis much contracted in its transverse diameter. When both legs are wanting ("Sitzbecken"), the shape of the pelvis is the same as in double luxation: lengthening of the transverse diameter with approximation of the crests; marked flattening.

No. 9.—*Split pelvis, pelvis fissa* (Fig. 147).

Etiology.—Congenital failure of union between the two halves of the pelvis, almost always associated with exstrophy of the bladder. The weight of the trunk *plus* the pressure of the thighs produce marked rachitic characters.

Characteristics.—In the fetus the gap in the symphysis measures from 1¼ to 2½ in. (3 to 6 cm.); in the adult, from 3¼ to 6 in. (8 to 15 cm.). Marked increase in the transverse diameter at every point; the sacrum falls forward; the distance between the anterior superior spines is increased, that between the posterior superior spines is diminished. In rare cases synostosis of the iliosacral articulation is present, thus permitting function. The distance between the thighs is markedly increased.

The influence on labor is the same as in the justomajor pelvis. After labor prolapse of the uterus occurs regularly, otherwise the deformity occasions no obstetrical difficulties.

Spondylolisthetic Pelves.

No. 10.—**Spondylolisthetic pelvis** (Fig. 143).

Four grades are distinguished: (1) The fifth lumbar vertebra projects over the base of the sacrum; (2) It projects over the pelvic inlet; (3) It slips into the pelvic inlet; (4) It lies completely within the true pelvis. The latter variety may lead to fracture.

Etiology.—External injury and inflammatory processes. The interarticular portion is elongated; it represents the line of fusion of the anterior and posterior centers of ossification in the fetus. If fusion fails to take place fixation is effected by ligamentous masses (*spondylolysis interarticularis*), which predisposes to later spondylolisthesis.

Characteristics.—Contraction of the pelvic inlet due to the anterior dislocation of the body of the fifth lumbar vertebra. Lordosis of the lumbar portion is produced, so that the central vertebræ are on a level with the symphysis, which is higher than normal, while the upper portion of the sacrum is displaced backward and the lower portion forward, as in the funnel-shaped pelvis. On these factors depends the degree of contraction.

The lateral interarticular portions of the last lumbar vertebra become elongated (cf. Fig. 143) and thus give support to the spondylolisthetic vertebral column. Synostosis takes place between the bodies of the vertebræ.

The pelvic inclination is practically obliterated; the transverse diameter of the false pelvis is increased, while the pelvic inlet is slightly, and the outlet markedly, contracted. The anteroposterior diameters are all diminished.

Influence on Pregnancy and Labor.—Pendulous abdomen. Tendency to transverse positions. If the pelvic inclination is slight, marked lordosis of the lumbar spine exerts an unfavorable influence on labor; the head in its descent is unable to adapt itself to the sudden increase in the angle of the pelvic cavity. The degree of contraction may be so slight that labor may be terminated spontaneously, or Cesarean section may be required.

Diagnosis.—There is a history of injury in childhood. Lumbar lordosis and prominence of the hips laterally; the thorax reaches almost to the pelvis and transverse folds of skin are seen. The conjugatosymphyseal angle is diminished and the rima pudendi is placed too far forward. The presence of the spondylolisthetic angulation is most easily detected by palpation, beginning at the lumbar portion and going down, and the marked gibbosity between the kyphotic sacrum and the lordosed lumbar spine affords an important diagnostic point to distinguish this variety from the rachitic and from the lumbosacrokyphotic pelvis.

Treatment.—A conjugata pseudovera of 2⅜ in. (6 cm.) is an absolute indication for Cesarean section; from 2⅜ to 3 in. (6 to 7.5 cm.) for craniotomy or Cesarean section; from 2¾ to 3¼ in. (7 to 8 cm.) for induction of premature labor between the thirty-second and thirty-sixth weeks; from 3¼ to 3⅝ in. (8 to 9 cm.) for expectant treatment.

Podalic version should never be employed (see Funnel-shaped pelves, No. 5*a*).

Assimilation-pelves with so-called "Intercalated" Vertebra.

No. 11.—**Assimilation-pelvis with intercalated vertebra** (properly called **transitional vertebra**).

No. 11*a*.—*Asymmetrical assimilation-pelvis* (Fig. 137).

Etiology.—Hereditary arrest of development or imperfect development. Either the twenty-fifth vertebra has not assumed its sacral character on both sides or the twenty-fourth vertebra partially partakes of the sacral type.

Characteristics.—On one side there is complete absence of the ala, on the other side the transverse process of the lumbar vertebra is preserved. Thus, the imperfectly developed vertebra is not properly supported and descends. Lumbar scoliosis results and, finally, oblique contraction of the pelvis toward the opposite side is superadded. When combined with rachitis these peculiarities are very marked. The oblique contraction does not take place when the articular surface of the lower vertebra projects upward and thus supports the imperfect upper half of the vertebra.

No. 11*b*.—*Symmetrical assimilation-pelvis* (Fig. 135).

Etiology.—The same as in the last variety, except that either the twenty-fourth vertebra has developed with a sacral vertebra—upper assimilation; or the thirtieth vertebra has done so—lower assimilation.

Characteristics.—In upper assimilation, where the entire twenty-fourth vertebra forms part of the sacrum, the promontory is high; the intervertebral disk between the first and second vertebræ persists, and the angle of the promontory is very little developed. As a result the curvature of the lumbar portion is diminished and the center of gravity is displaced forward; compensation is effected by diminution in the pelvic angle and slight anterior inclination of the upper portion of the body. The transverse diameter is diminished and the pelvis assumes the funnel shape characteristic of the kyphotic pelvis.

There are cases of true supernumerary vertebræ in the form of arches without bodies, since the latter are derived from the arch (Gegenbauer, Rosenberg).

Anomalies of the Pelvis due to Bone-tumors and Exostoses the Result of Fractures.

(Figs. 148–150.)

No. 12.—*Acanthopelys* (Fig. 148).

Often seen in rachitic individuals. Ossification of the ecchondroses which normally form as the individual develops (Virchow).

The spiny exostoses are seen at the symphysis, the iliopubic tubercle (acetabulum), the sacro-iliac synarthrosis, and the promontory.

They often lead to necroses and to rupture of the uterus.

No. 13.—*Tumors of the pelvic bones.*

No. 13*a.*—*Enchondroma* (Fig. 150).

Heteroplastic, hence first formed from pre-existing cartilage (Virchow). They show a tendency to ossification.

They usually grow from the posterior wall of the pelvis and fill almost the entire excavation, like fibromata.

Cesarean section is usually required.

No. 13*b.*—*Fibroma*, rarely as large as the last-mentioned tumor.

No. 13*c.*—*Sarcoma.* The most frequent varieties are round-celled, spindle-celled, and soft medullary sarcomata.

They are usually very large and grow from the posterior wall.

No. 13*d.*—*Cysts.* Combined with sarcoma or enchondroma.

No. 13*e.*—*Carcinoma.* Metastatic. Rarely of large size; it leads to osteoporosis, hence the bones are soft.

No. 13*f.*—*Hydrorrhachis.* Due to failure of union. Secondary unilateral scoliosis and asymmetry. The sac should not be disturbed.

No. 14.—*Fractures* (Fig. 149) of the sacrum, ramus of the ilium, of the acetabulum, with or without callus-exostoses, and with or without oblique contraction (in Fritsch's case contraction was due to fracture of the right ala).

Generally Enlarged Pelves.

No. 15*a*.—*Generally enlarged (justomajor) pelves.*

Abnormal development, in women either of gigantic stature or of ordinary height.

The increase in the various diameters rarely exceeds $\frac{4}{5}$ in. (2 cm.). The enlargement is greatest in the antero-posterior direction.

No. 15*b*.—*Funnel-shaped enlarged pelvis.*

Abnormal development. The outlet is normal, the inlet only being enlarged.

No. 15*c*.—*Enlarged pelvis due to flattening of the iliac bones.*

Abnormal development. Instead of 130 to 140 degrees, as in the normal female pelvis (150 to 160 degrees in the male), the angle formed by the iliac bone with the lateral wall of the true pelvis is 105 degrees.

Influence on Labor.—Premature engagement of the head in the superior strait and rapid, or even precipitate, delivery if the labor-pains and the contractions of the abdominal muscles are vigorous. The head fails to perform the regular rotatory movements; the occiput may descend into the hollow of the sacrum or the anterior fontanel may present.

CHAPTER VII.

PATHOLOGY OF LABOR.

§ 20. LACERATIONS OF THE GENITALIA DURING LABOR.

(*a*) **Rupture of the Uterus.**—Rupture during pregnancy, especially if attended with marked septic phenomena, always raises a suspicion of criminal abortion. A rup-

FIG. 151. **Child from an Oblique Presentation, Position with the Body Doubled on Itself, "Conduplicato Corpore"** (neglected transverse position).—Labor was impossible; the child died. Arm and shoulder prolapsed and were markedly edematous and excoriated (original water-color from a preparation in the Heidelberg Gynecological Clinic).

tured rudimentary horn or tubal sac has often been mistaken for the rupture of a normally formed uterus. Spontaneous ruptures occur after Cesarean section, the uterus giving way at the site of the scar (see § 14, under Traumatism; § 15, 1*b*; § 17). Injuries during labor are divided according to their *etiology* as follows:

(*a*) *Lacerations;* (*b*) *erosions,* either (*α*) *incomplete,* or (*β*) *complete* or *perforating,* with or without total escape of the ovum into the abdominal cavity.

Lacerations are also divided according to their seat into: (1) rupture of the fundus; (2) transverse rupture going on to total separation of the body of the uterus from the vagina; (3) simple lacerations of the cervix; (4) lacerations of the cervix with solution of continuity in the vaginal vault, especially dangerous on account of infection.

The normal uterus in labor consists of the contracting muscular layer of the body which gradually diminishes in thickness as the cervix is approached, and in some cases, especially when the labor-pains are abnormally severe, ends abruptly at the contraction-ring, and of the distended "lower uterine segment," which includes the lower portion of the body of the uterus as far as its attachment to the peritoneum and the cervix (cf. § 6).

Below the uterus is fixed by the unyielding connective tissue of the lower portion of the cervix and of the vaginal vault and by the retractores uteri muscles, as described in § 6. Additional fixation is usually effected by the os becoming wedged in between the head and the pelvic wall. The resistance is supplied by the advancing body of the child as it passes through the inlet, the external os being fully dilated. The tears which are thus produced have been described in § 6 and illustrated in Figs. 16 and 17 in the text and on Plate 34, all taken from original

Tab. 67.

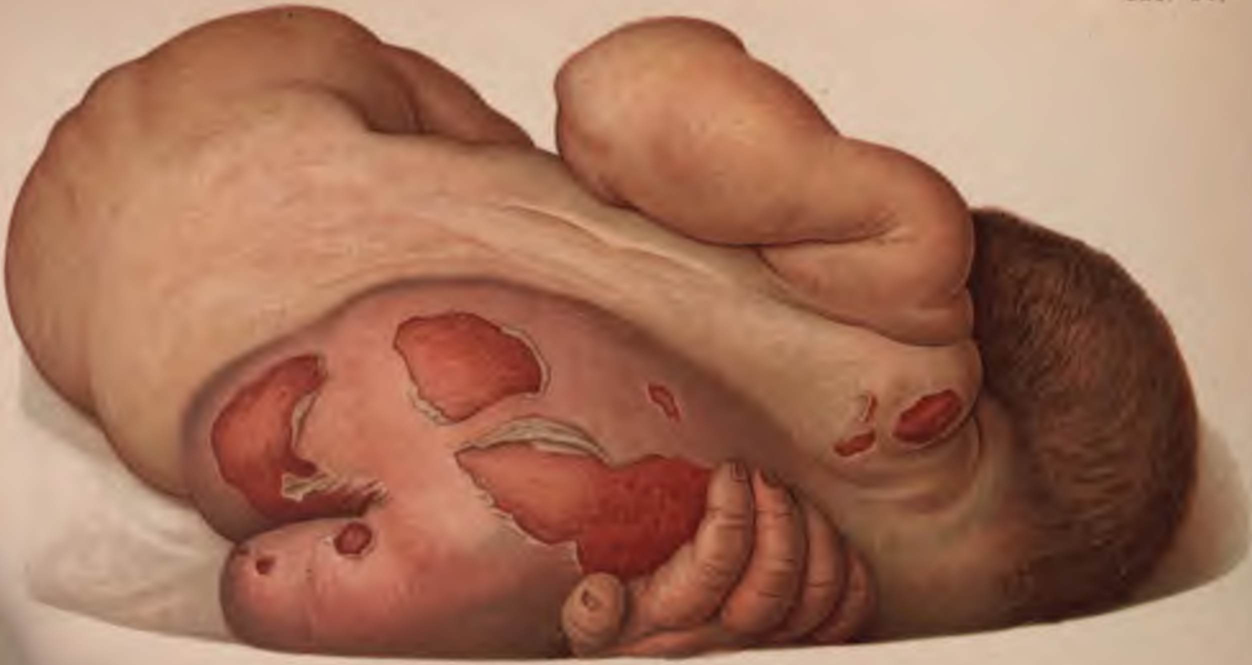

Fig. 151.

preparations. The excessive longitudinal distention becomes complicated by the pressure of the head against the pelvic wall. Hence we may have rupture even in the absence of pelvic contraction in hydrocephalus (Figs. 133, 133*a*, 152, 153, and 157), or in oblique positions of the fetus (see Fig. 98 and in the author's *Atlas of Labor and Operative Obstetrics*), especially in spontaneous development and in partus conduplicato corpore (*Ibid.* and Fig. 151). The contraction-ring recedes to the level of the navel, while the lower uterine segment becomes excessively distended. Thus the child's trunk is forced into the lower uterine segment and the latter begins to bulge. This is the time of greatest danger. The contracting fundus is held fast by the round ligaments, which are stretched to their utmost. If the abdominal pressure is not sufficient to force the head into the true pelvis it becomes dangerous because it acts through the body of the fetus on the lower portion of the uterine wall, which is already subjected to excessive pressure. The nerve-centers in this region are stimulated by this excessive pressure (§ 5) and thus give rise to renewed labor-pains and abdominal pressure. The fetal axis-pressure described in § 5 indicates the probable seat of the rupture. This pressure is increased even more by the introduction of the hand (violent rupture, rupture due to external violence), hence longitudinal tears occur most frequently in the lateral portion of the uterus.

The tear begins as a subperitoneal hematoma, the blood collecting between the separated muscle-fibers. There may be extensive separation of the peritoneum without complete or perforating laceration necessarily resulting; in Figs. 152 and 153 the remains of the original hematoma are seen.

Rupture of the anterior or posterior wall is less frequent, but, according to my collection of "one hundred and one complete ruptures with complete escape of the child into the abdominal cavity," appears to occur most frequently as a result of violent traumatism. Rupture of the fundus (Fig. 18 in the text), which by itself is exceedingly rare, was also observed to follow traumatism, as in the above-mentioned case of Simpson's, in which there was said to be fatty degeneration of the muscular layer, although the specimen was not examined until the third day of the puerperium. After the escape of the ovum the amniotic sac may be completely preserved, especially if the rupture is due to the giving way of an old Cesarean-section scar; but more frequently the amniotic fluid is discharged into the abdominal cavity, an accident which does not necessarily lead to infection.

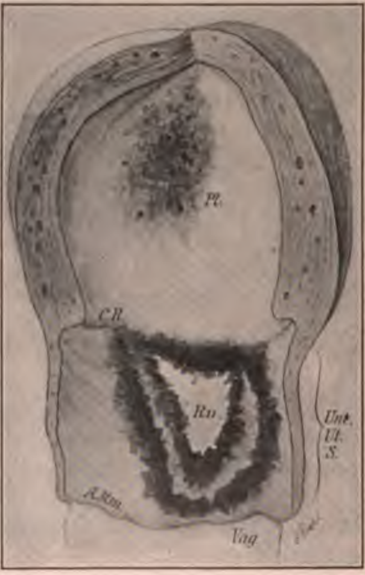

FIG. 16.—Funnel-shaped complete rupture of the uterus (*Ru.*), extending from the contraction-ring (*C.R.*) to within an inch of the external os (*A.Mm.*). This line corresponds to the posterior peritoneal attachment and to the insertion of the retractores uteri. *Unt., Ut., S.*, lower uterine segment; *Pl.*, placental site.

The most dangerous are transverse ruptures and those which open the vaginal vault.

From a *diagnostic* point of view, therefore, it is of the greatest importance to determine the moment when excessive distention of the lower uterine segment begins. The contraction-ring is high (that is, more than a hand's breadth above the symphysis, or even as high as the umbilicus). The head fails to engage in the true pelvis, the lower uterine segment causes the abdominal walls to bulge, simulating an overfilled bladder. The lower uterine segment as well as the round ligament are tense. The fundus is very small and hard and no fetal portions

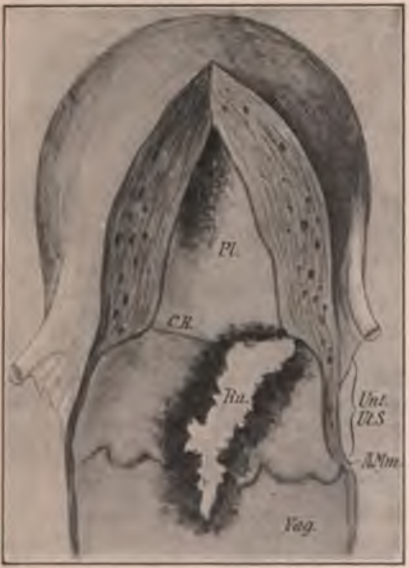

FIG. 17.—This rupture is analogous to that seen on Plate 34, except that it includes the lip of the external os. Both forms of rupture are particularly dangerous because the infectious germs in the vagina are able to make their way into the peritoneal cavity. Letters as in Fig. 16 (original drawings from preparations in the Munich Gynecological Clinic).

can be palpated. Labor-pains follow each other in rapid succession; pulse and respiration are greatly accelerated.

If the woman suddenly goes into collapse, labor-pains cease, and blood is discharged from the vagina, we know that rupture has taken place. The accident can be diagnosed from the outside; it is not necessary to introduce the hand for the purpose of making an exploration,

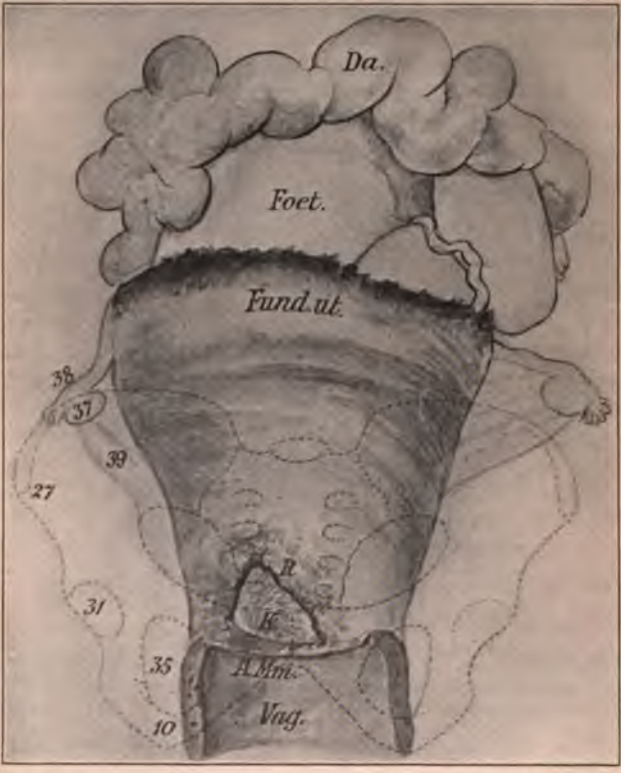

FIG. 18.—Rupture of the fundus with the fetus *in situ*; laceration at the external os.

as it only gives the woman pain and tends to increase the danger of sepsis. The various parts of the fetal body can be distinctly felt through the abdominal walls and in some cases can even be seen. The presenting part, head or shoulder, is found to have receded from the pelvic inlet.

Treatment.—If rupture is imminent the woman should be delivered immediately; unless Cesarean section is absolutely indicated it should not be attempted, on account of the delay of the necessary preparation if it is to be performed according to the rules of antisepsis. Hence, perforation, craniotomy, embryotomy, or decapitation should be performed. Version should never be attempted. On no account should the woman be allowed to exert abdominal pressure. An anesthetic should be given, and if the child is alive and the presentation favorable the woman should be put into Walcher's position after the labor-pains have subsided. If rupture has already taken place the child should be at once extracted *per vias naturales.* If the child has been completely discharged into the abdominal cavity the same procedure should be attempted. I think I have attained my object of pleading in favor of celiotomy by the collection of one hundred cases[1] of this kind, and I shall adhere to my view until the publication of a new series of at least a dozen cases of delivery *per vias naturales* convinces me that better results are obtained in that way; they were certainly worse in pre-antiseptic times. In any case of this kind the decision always depends upon whether infection of the peritoneum has occurred or not. Celiotomy enables us to control the hemorrhage and to repair the rupture in the uterus properly, but it also adds the danger incident to the entrance of air, to the irritation of the intestines with hands and sponges, and to the caustic effect of antiseptic fluids. These things must be avoided as much as possible. If infection has already taken place it cannot be removed, and the least excoriation of the endothelium on the peritoneum permits its entrance into

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[1] *Münch. med. Woch.*, 1889, and *Inaugural Dissert.*, Munich, 1886.

FIG. 152. **Complete Rupture of the Uterus**; one arm is protruded into the abdominal cavity; due to brow presentation of a hydrocephalic fetus in contracted pelvis (see Figs. 133, 133*a*).—Abnormal anterior rotation of the right cornu of the uterus; the round ligament on the right side and the corresponding tube are visible (they were palpable before); the bluish color indicates the limits of the subperitoneal hematoma in the broad ligament and in the perimetrium.

FIG. 153. The ruptured uterus of the same case (Fig. 152). (Both original water-colors from a case in the Heidelberg Obstetrical Poliklinik).—At the fundus the fold in the perimetrium due to the contractions is readily recognized. The placenta and fetal membranes are in the fundus uteri. The umbilical cord passes through the intact cervical canal into the vagina. The rupture is on the right side. The intraligamentary connective tissue was the first to give way, the resulting hemorrhage (the cruor of which is visible) separating the serosa until it ruptured. The separation of the perimetrium can be plainly seen in the upper part of the picture.

the peritoneal cavity. If this accident is avoided celiotomy itself appears to have a favorable effect, as in tuberculous peritonitis. This has been proven experimentally and bacteriologically by Barbacci[1] and others; clinically by Fritsch, v. Winckel, etc.

Drainage of Douglas' pouch with iodoform gauze and drainage-tube, combined with compression of the abdomen, is applicable in most cases; in others it will be better to drain by means of a strip of gauze inserted into the lower angle of the wound.

If it is probable that infection has not taken place the question of suturing a smooth rupture might be considered.

In a case of fibrinous peritonitis the author once performed a successful Porro amputation twenty-seven hours after complete rupture with escape of the head into the region of the liver. The pedicle and Douglas' pouch were covered with iodoform gauze which was passed out through the cervix.

Opening of the vaginal vault in combination with celiotomy always terminates fatally. There is one case reported by Leopold in which a cure was effected by means of a Porro amputation. The proportion of re-

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[1] See abstract of mine in *Centralbl. f. Gyn.*, about the end of 1893.

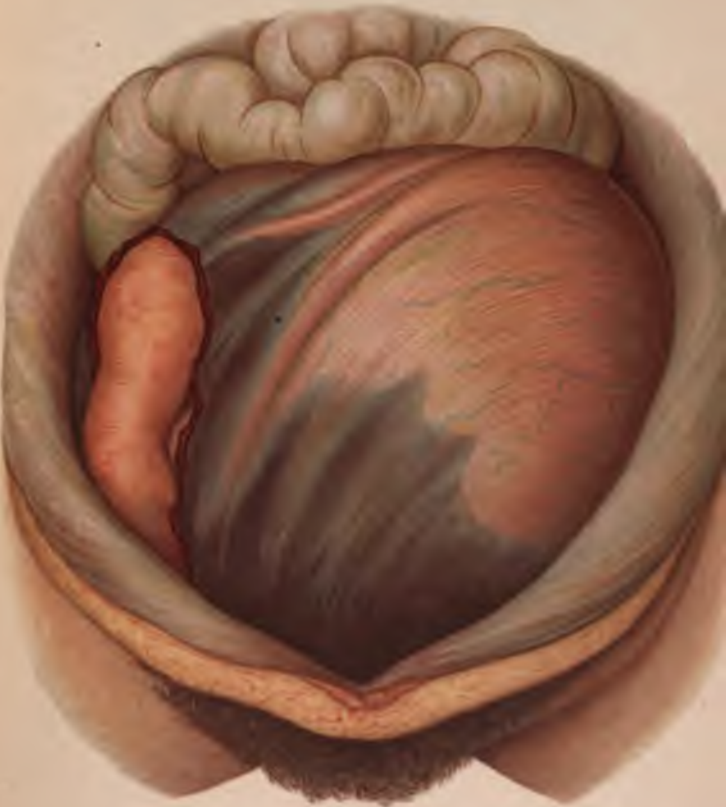

Fig. 152.

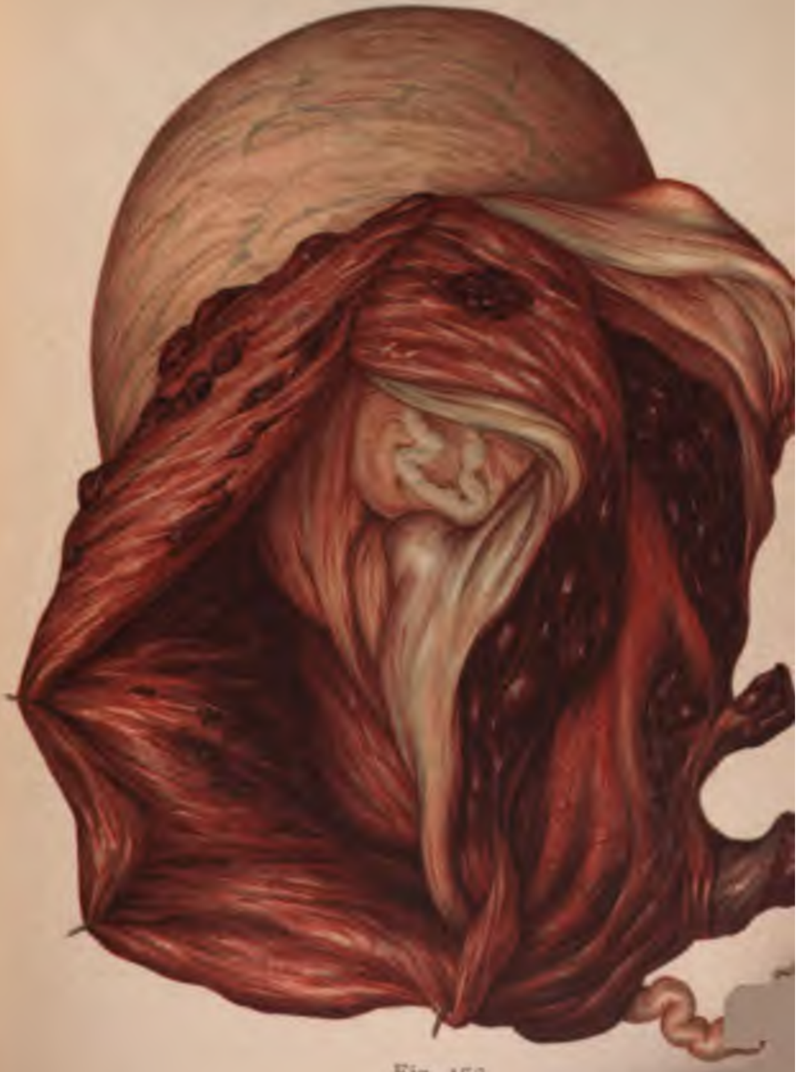

Fig. 153

Lith. Anst. F. [illegible]

coveries in celiotomy without this complication range from 26 to 100 per cent., according as the conditions are favorable or unfavorable; that is to say, 26 per cent. when labor is protracted and other operative attempts are made or the vesico-uterine pouch is opened; from 44 to 47 per cent. in cases of protracted labor with discharge of the amniotic fluid, but without attempts at operation. These results compare rather favorably with the results of Cesarean section, but they serve to show the danger of any other obstetrical operations *per vias naturales.* The general practitioner has no other recourse than to extract the fetus through the tear and then to tampon the cavity, or, after drawing the uterus down, to suture the lacerations with the aid of a grooved (Sims') speculum. This conservative procedure is the only one admissible in incomplete rupture without, or with only partial, escape of the child into the abdominal cavity, unless there is extensive laceration of the uterine wall and especially of the intraligamentary tissue, or infection has already taken place. Under such circumstances vaginal hysterectomy or celiotomy with Porro amputation are the proper modes of procedure.

(*b*) **Erosions of the Uterine Wall.**—As has been fully explained in §§ 17 and 19, and illustrated in Figs. 130–132, the fetal skull suffers characteristic indentations which may lead to hemorrhages, necroses, and incomplete fractures. The corresponding portion of the cervix also becomes perforated or local pressure-necrosis results. The seats of predilection are the promontory, the spiny prominences so frequently seen in the rachitic pelvis, the symphysis, and the iliopectineal line. The resulting losses of substance have a characteristic circular, funnel-shaped outline. They usually heal spontaneously, being at once incapsulated by the development of adhesive peritonitis. They do not give rise to any special symptoms.

If the lesion occurs at the anterior wall a urinary fistula is apt to form. This occurs in the great majority of cases as a result of necrosis. The plug of necrotic tissue separates in a few days, so that incontinence is not, as a rule, discovered until the third or fourth day of the puerperium. (For the treatment, see the author's *Atlas of Gynecology.*)

(*c*) **Lacerations of the Cervix.**—Lacerations at the os possess a certain significance, as they lead to characteristic ulcerations (Fig. 18 in the text) and sometimes to acute parametritis.

Deeper tears of the cervix are usually produced by obstetrical instruments and, if they extend to the vaginal vault or into the subperitoneal connective tissue, may become very serious, as they come within the distribution of the uterine arteries (see § 1, Fig. 3). The *diagnosis* between hemorrhage due to atony of the muscle and traumatic hemorrhage is therefore of the highest importance. Only when the uterus feels hard to the touch is it permissible to make a digital examination (always under strict aseptic precautions) for the purpose of examining the mucous membrane of the vagina, of the portio vaginalis, and of the cervix for the presence of lacerations.

Treatment.—The tear should be sewed up either without the use of a speculum under the guidance of two fingers (in the dark, after Veit), the needle being held in a needle-holder and the uterus pressed down by an assistant, or with a speculum and Muzeux's tenacula.

The *etiology* and the *prognosis* vary according to the site of the tear. For practical purposes we distinguish:

(1) Lacerations of the vaginal vault;

(2) Lacerations in the central portion of the vagina;

(3) Lacerations in the fossa navicularis, with or without injury to the perineum.

Lacerations of the vaginal vault are found almost exclusively in the posterior fornix, and are due either to external violence or to direct pressure of the head on the brittle and inelastic tissues of the vaginal vault, which has been drawn upward by the violence of the labor-pains before the head had entered the superior strait. In a normal pelvis the failure of the head to engage in the superior strait is due to some abnormality in the labor-pains, *i. e.*, partial tetanus or unequal contractions of the uterus, to the improper direction of the contractions, as in pendulous abdomen, or when the women is delivered in a standing posture with the body bent forward.

The tears produced in this way are very extensive and terminate fatally, either by undermining the vascular base of the broad ligament and giving rise to profuse hemorrhage, or, if the peritoneal cavity is opened, by peritonitis. More rarely death results from the decomposition of shreds of tissue in the cavities on either side of the uterus. The child and the fetal membranes are usually forced wholly or partially into the laceration. The *symptoms* in many cases are not at all alarming, but the *prognosis* must be considered unfavorable.

Treatment.—Immediate extraction of the child *per vias naturales* on account of the danger of internal hemorrhage; repair of the laceration, especially of the serous membranes, or, if that is impossible, tamponade and drainage. If the operator is certain that the peritoneum is intact, irrigation may be practised later on, if the tissues decompose and the wound suppurates, or Stschetkin's plan of making an extraperitoneal lumbar incision with counter-drainage may be adopted. It is often difficult to determine whether or not the peritoneum is intact, as it is very much attenuated and loops of intestines can easily be felt through it. If the hemorrhage is uncontrollable, or the wound is very badly lacerated, vaginal extirpation, or, if necessary for the ligation of vessels, celiotomy must be resorted to.

Tears in the central portion of the vagina are usually due to external violence, such as premature elevation of the forceps, and are usually longitudinal; they rarely lead to the formation of a rectovaginal fistula. Much more frequently a vesicovaginal fistula results, which, as a rule, is not discovered until several days later, after the separation of the necrotic tissue, when incontinence of urine makes its appearance.

These tears are also to be carefully sewed up. Tears in the vagina and perineum are usually situated to one side of the posterior column of the vagina. They may occur during the passage over the perineum either of the head or of the shoulder. Occasionally the laceration is confined to the mucous membrane of the fossa navicularis, so that the perineum and frenulum appear intact on the outside although extensively undermined internally.

According to the degree of functional disturbance to which they give rise perineal lacerations are divided into three grades:

(1) Lacerations of the frenulum;
(2) Lacerations extending to the sphincter ani;
(3) Lacerations into the rectum.

These lacerations are to be at once repaired in every case (for the technique, see *Atlas of Labor and Operative Obstetrics*). If the sutures are introduced before the placenta is expelled, its subsequent extraction may prevent primary union. This mode of healing can be expected to take place in general only when the laceration is repaired within the first six hours; occasionally it may be possible to obtain secondary union, as, for instance, when the laceration has not been repaired in the first place and the woman is obliged to go back to work soon after delivery.

Healing may occur even in spite of a marked rise of temperature. The author once saw a case in which the temperature rose to 103.6° F. (39.7° C.) on the first evening, a small abscess having formed, which ruptured toward the edge of the newly formed frenulum without interrupting the healing of the vaginal and perineal granulations.

§ 21. DYSTOCIA DUE TO ANOMALIES IN THE POSITION AND FORM OF THE GENITAL ORGANS, INCLUDING TUMORS.

(*a*) **Dystocia due to Malformations of the Genital Organs.**—In rudimentary organs (uterus unicornis) or in the anomalies due to persistence of the bilateral fetal character of the organ, such as uterus bicornis, uterus septus, vagina septa, the sources of danger during labor consist in the great tendency to lacerations and in anomalies of the labor-pains, due to the weakness of the muscular tissue and their oblique direction with reference to the pelvic inlet. In the first place the malformation affects the position of the fetus. In uterus septus the position is longitudinal with a preponderance of vertex presentations. In uterus bicornis with a common uterine cavity there is a greater liability to pelvic presentations; in uterus introrsum arcuatus (Fig. 98) the lateral expansion of the uterine body often gives rise to transverse positions of the fetus, the tendency being often increased by the shortening of the anteroposterior diameter, which frequently accompanies this anomaly. The relative width of the uterine cavity also predisposes to placenta prævia. The disturbances which take place during pregnancy have been discussed in § 15.

Labor.—The deviation in the axis of the gravid horn of the uterus from the very beginning determines the expulsion of the fetus in an oblique direction, so that the opposite wall of the pelvis (Fig. 97) offers an increased resistance, and this, when assisted by the unequal distribution of the muscular tissue and frequent displacement of the non-gravid horn of the uterus, may lead to lacerations of the lower uterine segment or to an extraordinary prolongation of labor (missed labor). A similar effect may be produced by the presence of a rigid septum in the vagina. Severe hemorrhage may result if the placenta is inserted in the septum of the uterus which is capable of contracting.

A further obstacle to labor may be presented by the displacement of the non-gravid horn into the pouch of Douglas, which not rarely occurs. The uterus becomes wedged in under the promontory and obstructs the true pelvis.

If pregnancy in a rudimentary cornu or in one which is completely shut off from the uterine cavity (see Fig.

111) goes on to term, Cesarean section with removal of the cornu is required.

(*b*) **Dystocia due to Acute Flexion and Sacculation of the Uterus.**—Under this head are included anteflexion, lateroflexion, and sacculation of the uterus.

Labor.—In anteflexion the force of the labor-pains or the power of the abdominal muscle may be defective. A more dangerous complication consists in the head being forced against the promontory; that is to say, in the sagittal suture being brought nearer to that structure (see Figs. 130, 131, and in the author's *Atlas of Labor and Operative Obstetrics*, Fig. 15, Nägele's obliquity); or in the head being forced down on the symphysis, thus causing angulation of the vertebral column (*Atlas of Labor and Operative Obstetrics*, Fig. 16, and severer grades), *i. e.*, approximation of the sagittal suture to the symphysis (presentation of the posterior parietal bone). For further details see under Contracted Pelves, especially §§ 19, 20, Nos. 2 and 3.

Treatment.—The anterior displacement of the fundus must be corrected by laying the woman on her back and maintaining a backward fixation of the uterus by means of towels and binders. (For operative procedures see the sections just referred to.)

For similar reasons lateroflexion of the uterus, which is a frequent accompaniment of pendulous abdomen, especially if the woman lies on the wrong side or tosses about from side to side, may force the head against the lateral wall of the pelvis and thus lead to face or transverse presentations. The *treatment* consists in maintaining the head in a median position at the superior strait, or possibly in converting it into a footling presentation by means of pillows placed under the woman's body, by placing her on the appropriate side, and by means of external or internal manipulations (version; manipulations for correcting the position of the fetus, see *Atlas of Labor and Operative Obstetrics*).

Partial angulation and sacculation of the uterine wall is observed toward the end of pregnancy, or during labor, whenever any part of the uterine wall becomes abnormally fixed. Thus, in already existing retroflexio uteri; in arrest of the head under the promontory; in perimetritic or parametritic distortions; when the uterus is fixed either too high or too far to one side and the anterior wall is unable to develop during pregnancy (vagino- and ventro-fixation); when myomata and cysts are present; when the gravid horn of a uterus bicornus is wedged in under the promontory; and, finally, when the direction of the uterine contraction is abnormal in pendulous abdomen; possibly, also, in retroposition or retroversion of an anteflexed (generally infantile) uterus in primiparæ (Dührssen).

Sacculations may occur in the anterior or in the lateral walls, but are most frequent in the posterior wall—partial retroflexion of the uterus. Labor may be seriously protracted or brought to a standstill if the head is forced into the sacculation. The external os fails to dilate and is usually displaced from the pelvic axis, so that the head pushes the sacculated portion of the wall farther and farther into the vagina; or the head deviates at the pelvic inlet and impinges on the lateral wall of the pelvis, so that we have brow, face, or transverse presentations. The danger consists in laceration of the uterine segment or sepsis derived from old perimetritic foci.

Treatment.—The first thing to do is to determine whether the bladder is full and, if so, to empty it at once (see § 15, 2*a*). Next, the presenting portion (head) is to be brought in line with the internal os or with the pelvic inlet, while the external os and the cervical canal are returned to the pelvic axis. If possible the primary obstacle must be removed.

When there is partial retroflexion of the uterus (Fig. 103) and the head is movable in the pelvic inlet, podalic version and extraction offer the best prospects, if putting the woman in the proper position on the side corresponding to the deviating presenting part and forcibly pressing the head into the pelvic inlet have not proved successful.

If the head has entered the true pelvis and is movable, the anterior displacement of the os should be corrected with the finger, or a colpeurynter should be introduced into the cervical canal. If the cervical canal fails to distend, the vaginal vault should be opened as far as the external os, the incision extended into the lower uterine segment, and the child extracted through the aperture thus made. In the case of cysts, myomata, and uterus bicornis the force of the labor-pains is occasionally sufficient to draw the sacculated portion from the hollow of the sacrum up to the abdominal cavity, even in cases that have obstinately resisted manual reposition; the latter should always be attempted before the abdomen is opened for the purpose of performing supravaginal amputation or total extirpation of the uterus.

If rupture threatens, the patient should be anesthetized and a Champetier-Ribes colpeurynter inserted, or the above-mentioned incision may be performed. In transverse presentations that have resisted all attempts at correction embryotomy or Cesarean section is indicated. Every effort should be made to preserve the integrity of the amniotic sac, as its preservation materially improves the chance of dilating the cervical canal.

(c) **Atresiæ, Stenoses, and other Obstacles to Labor in the Soft Parts of the Parturient Canal.**—Impregnation may take place when there is the smallest possible opening in the hymen, which may later even become entirely closed, or when the hymen is quite intact (hymen septus sive bifenestratus, see *Atlas of Gynecology*, Fig. 2 in the text). The head impinges on this obstacle, which must, therefore, be incised. A similar obstacle to labor is opposed by remains of septa in a double genital canal (vagina septa, collum septum, uterus subseptus).

Even after impregnation has taken place atresiæ and rigidity of the vulva, vagina, and cervix may be acquired through ulcerations or severe inflammations of the vagina; they may be present before impregnation takes place in elderly primiparæ after operations on the portio vaginalis (wedge-shaped excision) or plastic operations on the perineum.

A case of this kind was in the Munich Gynecological Clinic in 1892 and 1893. Nitric acid had been injected into the vagina to bring on an abortion. A few days before labor the vagina was opened and craniotomy was performed, when a cicatricial stenosis resulted.

In all such cases there is danger of deep lacerations extending into neighboring organs, or of the external os being completely separated and prolapsing in front of the vulva. Hence an early incision is required, followed by the application of forceps or craniotomy or, if the parturient canal is obstructed by too great a mass of adhesions, Cesarean section may even be required. The so-called "conglutinatio orificii externi" of primiparæ consists simply in a stenosis of the rigid external os, which can scarcely be palpated. The *treatment* consists in dilating it with the finger and making shallow incisions.

Large cystoceles with inversion of the vagina often lead to a tumor-like stenosis of the birth-canal; they are particularly dangerous when they are due to a vesical calculus. In such a case lithotomy must be at once performed. In simple cystocele the bladder should be immediately evacuated; the concavity of the catheter must be directed downward to correspond with the posterior deflection of the urethra.

A similar obstacle is presented by a subcutaneous hematoma of the vagina or vulva, which occurs in one-third of all the cases during labor on account of the great vulnerability of the venous plexuses and the increased intra-abdominal pressure. In twin labor it may seriously threaten the life of the second twin. As soon as there is danger of rupture or of labor coming to a standstill, the hematoma should be incised, the child rapidly extracted, and the hemorrhage controlled by ligating the bleeding vessels or by tamponade.

In very rare instances labor may be obstructed by true vaginal tumors, fibromata, myomata, and cysts, which act much in the same way as the myoma of the cervix seen in Fig. 107, which was spontaneously expelled. They require the same treatment. Cysts are to be punctured.

(*d*) **Labor Obstructed by Uterine Fibromata.**—The diagnosis, the effect on labor, and the treatment have already been discussed, at least in part, in § 16*a*. It remains to determine what is the proper line of action when labor is already in progress and a complication of this kind exists.

If the head is unable to make its way past the tumor into the true pelvis there is danger of rupture, usually of the fundus uteri. Submucous myomata of the cervix may be enucleated and "delivered" (Fig. 107). Large intramural myomata, on the other hand, form an absolute hindrance to labor and are, therefore, the most dangerous. Tumors situated high up, within reach of the uterine contractions, are often drawn up out of the true pelvis with astonishing ease when compared with the difficulty of manual reposition.

Owing to the irregular outline of the pelvic inlet—not to mention the transverse presentations to which this condition often gives rise—there is great danger of prolapse, either of the umbilical cord or of one of the extremities. In addition there is great danger of injury to the cranial bones. A frequent result of a partial obstruction is placenta prævia, as is tubal pregnancy.

In addition to the mechanical obstruction to which they give rise tumors may exert injurious effects on account of changes in the tissue of the tumor itself or of the uterus. The fibrous elements undergo rapid proliferation and either become markedly edematous or undergo myxoid or colloid degeneration; the contractile elements do not participate in the process. In this way they increase the danger of infection, of rupture, and of hemorrhage, and diminish the force of the labor-pains (missed labor, especially in intramural myoma). The tumors are very liable to become crushed and then to slough.

The dangers to labor, therefore, consist in excessive duration with secondary diminution in the force of the labor-pains; rupture of the uterus; obstruction of the birth-canal; anomalies in position and especially in the attitude of the child; anomalies in the insertion of the placenta; and prolapse of an extremity or of the umbilical cord.

During the puerperal period the interference with uterine contraction predisposes to hemorrhage or retention of the placenta.

Treatment.—This depends on the behavior of the myoma. If neither the force of the labor-pains nor manipulation suffices to push it out of the way and it cannot be extirpated, or if from its size and position it constitutes an absolute hindrance to labor, the child must be delivered by Cesarean section at term or when it has reached viability. In most cases it is best to perform a supravaginal Porro amputation with retroperitoneal disposal of the pedicle, or total extirpation of the uterus with the placenta, so as to avoid the danger of sepsis and the effects of thrombosis and embolism.

Another source of danger after delivery *per vias naturales* is found in the tendency of the myoma to slough, so that, even after a natural delivery, it may be wise to operate.

On account of the elasticity of myomata and the changes in shape produced in them by the action of the labor-pains, the degree of pelvic contraction which they produce is not the same as that due to deformity of the pelvis; if the tumor occupies about one-third of the pelvis and cannot be pushed out of the way, craniotomy is indicated in vertex presentations and extraction in pelvic presentations; if the tumor fills one-half of the pelvis Cesarean section is called for.

(*e*) **Labor Obstructed by Ovarian Tumors.**—The most dangerous are the small solid ovarian tumors which remain fixed in the pouch of Douglas and prevent the head from entering the pelvis. The pressure on the tumor leads either to necrosis or to rupture, thus forming a favorable site for septic infection; or rupture of the uterus or of the vagina takes place. In some cases the tumor is squeezed flat and finally pressed up over the pelvic inlet, the pedicle in such cases being usually torn or twisted.

Treatment.—If attempts at reposition are unsuccessful, tapping is to be considered. If this procedure does not suffice, vaginal ovariotomy or even Cesarean section, followed by removal of the tumor, may have to be performed.

(*f*) **Labor Obstructed by Carcinoma.**—The rigidity of the tissues and the possibility of delivery *per vias naturales* will depend on the amount of cervical tissue involved in the carcinomatous infiltration. If it is found that the presenting part fails to descend, and the vaginal portion does not dilate under the action of vigorous labor-pains, it may be inferred that the obstacle is insurmountable, and one of the following procedures is indicated: Deep crucial incisions in the portio vaginalis; incision of the lower uterine segment through the anterior vault of the vagina after the bladder has been dissected away; or, finally, Cesarean section, followed in every case by total extirpation of the uterus if the process has not yet extended to neighboring organs, the body of the uterus being removed through the abdominal section and the cervix through the vagina.

§ 22. DYSTOCIA DUE TO ANOMALIES IN THE OVUM OR FETUS.

Dystocia due to abnormal position, attitude, and presentation of the fetus has been discussed in the *Atlas of Labor and Operative Obstetrics*.

(1) **Twin and Multiple Pregnancies.**—G. Veit found in the analysis of 13,000,000 births one case of twins to 88 single births, one case of triplets to 7910 single births, and one case of quadruplets to 37,126 single births. About a dozen cases of quintuplets have been reported in modern times in various countries.

Multiple pregnancy is due either to the fecundation of several ova discharged at the same menstruation or to the fecundation of a single ovum containing several germs (see Fig. 5). In the latter variety (twins, etc., from one ovum) the fetal membranes are common, except that each fetus has its special amnion and the children are of the same sex; in the former variety each fetus has its own chorion or decidua reflexa and the children may be of the same or of different sexes.

In multiple pregnancies from a single ovum anastomosis of the placental vessels takes place and this leads to the so-called third circulation. If the latter is not symmetrical there results, according to Schatz, a difference in the development of the various fetuses. If one portion of the placental system is insufficient the corresponding fetus dies and is known as fetus papyraceus, because it becomes mummified and pressed flat by its fellow (Fig. 100).

The *diagnosis* of twin pregnancy is determined by

(1) The palpation of more parts of the same kind than can be accounted for by one child (two amniotic sacs, two heads, and more than four extremities);

(2) By the palpation of parts in such a situation that they cannot possibly belong to the same child;

(3) By hearing fetal heart-sounds distinctly in two widely separated areas and possibly with varying rhythms;

(4) By the possibility of varying the position of one child by means of pressure on the presenting part without affecting that of the other.

Occasionally a longitudinal groove can be made out on the abdomen.

Labor.—As a rule, both twins are delivered in vertex presentations, but pelvic or abnormal presentations are much more frequent in multiple than in single births; in more than two-thirds of all the cases labor takes place prematurely. It is protracted for the first child and accelerated for the remaining ones. The mortality is greater in multiple than in single births, especially for boys, because, according to Veit, they are larger and possess less vitality. The placenta is usually delivered after the last child is born; often the uterus fails to contract, in which case postpartam hemorrhages must be guarded against by the administration of ergot. The interval between the delivery of the two children may amount to several hours. If the placenta of the second child appears before the latter is born it must, of course, be extracted with all possible speed.

The placental extremity of the umbilical cord of the first child must always be ligated in order to prevent the second child from bleeding to death.

(2) **Malformations.**—These rarely form an obstacle to labor. The most frequent form is internal hydrocephalus, consisting in dropsy of the lateral ventricles. In milder grades there is very little alteration in the fontanels and sutures, and it is, therefore, difficult to make the diagnosis during labor. In severer grades with an effusion up to 1 pint (500 gm.) the cerebral substance becomes much attenuated, the convolutions are completely flattened, and the entire skull converted into a flaccid bag of skin, as the result of the excessive gaping of the sutures and fontanels.

The condition is often associated with spina bifida and with malformations of the spine and spinal cord, of the diaphragm, of the abdominal parietes (umbilical hernia), with total absence of one kidney, talipes varus, congenital rachitis (micromelia), and with other forms of dropsy, such as ascites and polyhydramnion. Several hydrocephalous infants may be born by the same mother.

The deformity often gives rise to a pelvic presentation because there is less room for the head in the lower uterine segment than in the fundus, into which it is forced by the uterine contractions.

The *diagnosis* is difficult to make during labor. It is based on the wide separation of the fontanels and sutures, on the small triangular shape of the face in comparison with the large globular skull, and on the difficulties encountered by the presenting or aftercoming head in passing through the normal pelvic inlet; these signs can be detected only with the entire hand in the uterus.

The most difficult stage of *labor* is the entrance of the head into the pelvic inlet (Fig. 157). Under the action of the labor-pains the skull balloons out like a bladder and, being in the horizontal position, presents the largest periphery and the largest diameter. The deeper the anterior parietal bone is forced into the pelvic canal the more favorable is the prospect that at least one segment will effect an entrance into the superior strait; for instance, one-half the skull, or a brow, or anterior fontanel presentation. This tends to distribute the tension so that it acts partially above and partially below the superior strait. In this way labor may be terminated spontaneously in one-fourth of all cases, although the prominent bony portions of the advancing segment are very apt to produce lacerations in the swollen portio vaginalis. In some cases perforation of the skull is called for on account of the danger of rupture following the excessive distention of the lower uterine segment.

The size of the head may be abnormal as the result of fissures in the skull and hernial protrusions (meningocele frontalis, superior, posterior, epignathus). Their interference with labor is, however, less than in the case of marked hydrocephalus, because the hernial sacs are compressible and the skulls are usually small. A more serious obstacle is found in normal skulls of unusual size and hardness with correspondingly broad shoulders, especially in the children of elderly primiparæ. Forceps, version, and extraction of the aftercoming head, craniotomy, decapitation, and cleidotomy should be tried in succession. Hemicephalic and anencephalic monsters descend in the so-called "face presentation" (Fig. 154).

The trunk may be enlarged from the presence of hernial sacs, spina bifida, and omphaloceles (hernia of the umbilical cord, ectopia viscerum), tumors (coccygeal teratomata), and dropsical swellings of the body (ascites, distended bladder, and hydronephrosis due to atresia of the urethra, Fig. 158). The diagnosi

FIG. 154. **Presentation of an Anencephalus in so-called Face Presentation.**

FIG. 155. **Presentation of Dicephalus Dibrachius.**

FIG. 156. **Presentation of Thoracopagus** (copied from Küstner).

FIG. 157. **Hydrocephalus Presenting with Head in Partial Flexion**; excessive distention of the lower uterine segment with high position of the contraction-ring, *C. R.* (modified from Bandl).

FIG. 158. **Distention of Bladder and Ureters** with secondary hydronephrosis, due to atresia of the urethra combined with ascites; a coil of the umbilical cord has prolapsed (modified from v. Hecker).

cannot be made with certainty. The condition may call for version, craniotomy, or incision with the long Siebold scissors.

Among other complications may be mentioned double monsters. Figs. 155 and 156 illustrate the presentation of a dicephalus dibrachius and of a thoracopagus. The diagnosis can be made only after labor has begun by actual palpation of the monstrosity. Besides being very rare, these deformities are attended with little dangers to labor, as they practically always lead to abortion or premature labor.

(3) **Dystocia due to Anomalies in the Umbilical Cord and Fetal Membranes.**—The life of the fetus may be endangered by compression of the umbilical cord when it forms loops and coils, which may even be converted into true knots by the fetus slipping through them (this may occur as late as the fourth month), by prolapse of the cord (Fig. 158), or by torsion of the cord during pregnancy (Figs. 88 and 100).

The causes of prolapse of the umbilical cord are the same as those which produce prolapse of the extremities, namely, failure on the part of the large presenting part to fill the true pelvis. Compression can usually be detected by hearing the funic souffle (see §§ 6 and 7). A cord may be felt pulsating synchronously with the fetal heart. An attempt at reposition should immediately be made (after the method indicated in Fig. 85, *Atlas of Gynecology*), or, better, version should be performed and, if the os is completely dilated, immediately followed by extraction; if the os is not sufficiently dilated, combined version after Fehling should be employed, one extremity being left in the vagina with a fillet attached.

Tab. 70.

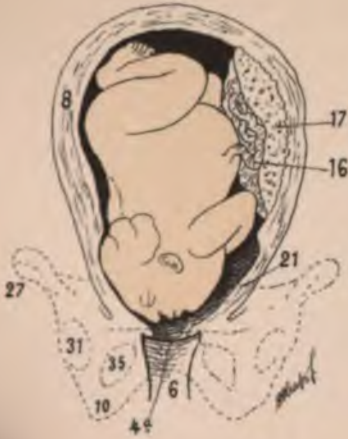

Fig. 154.

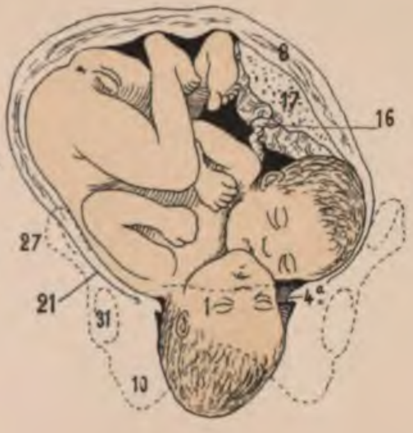

Fig. 155.

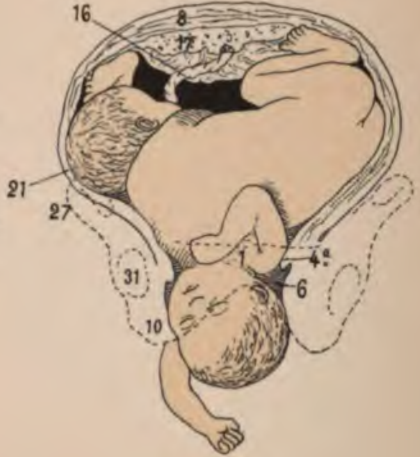

Fig. 156.

Lith. Anst F. Reichhold, München.

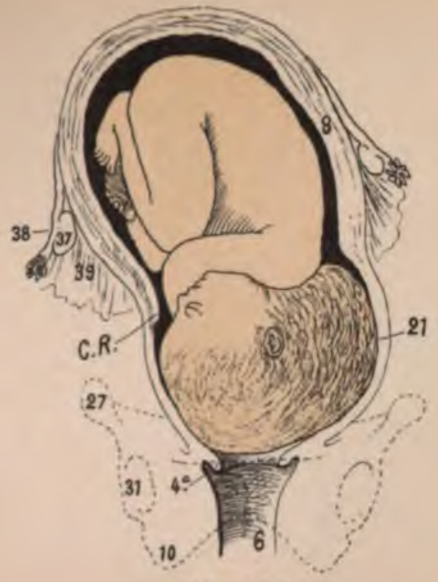

Fig. 157.

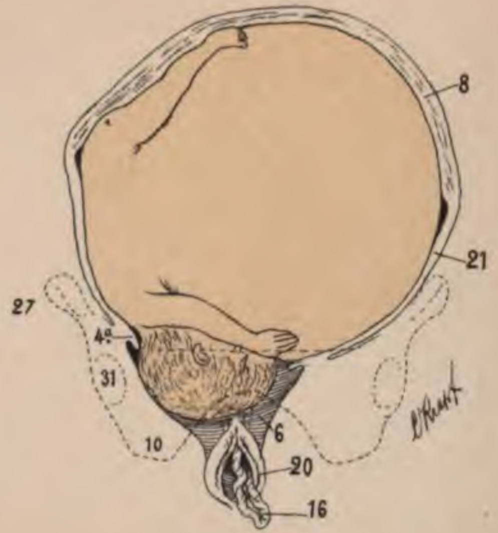

Fig. 158.

Lith. Anst F. Reichhold, München.

As a rule, looping of the umbilical cord leads to no disturbance until toward the end of labor, when the relative shortening of the cord may form a more or less serious obstacle. The *diagnosis* is difficult; the condition may be suspected if the rotation of the head on the floor of the perineum is unduly delayed, the labor-pains increase in force, the fundus of the uterus becomes painful, the recurrence of the fetal heart-tones in the intervals between labors is delayed, if the child appears restless or, possibly, if the funic souffle is heard. Sometimes it is possible to feel a coil around the neck of the fetus through the rectum.

There is danger of the child becoming asphyxiated on account of hemorrhage, not only in placenta prævia but also in velamentous insertion of the placenta. Fig. 14 in the text shows at once how easily a vessel may be torn under these circumstances, hence the child should be delivered with all possible speed, the amniotic sac being preserved intact as long as possible. The *diagnosis* is made by feeling the pulsating vessels in the external os. In puncturing the sac care should be taken to choose a non-vascular area.

Retention of the placenta is sometimes due to adhesion of the placenta following endometritis, but more frequently to excessive size of the placenta or angulation of the uterine wall. In the former case the placenta must be detached with the hand under strict antiseptic precautions (see *Atlas of Labor and Operative Obstetrics*, Fig. 42); but, as a rule, it is better to allow the mother to rest if there is no hemorrhage and to give ergot or morphine to quiet agitation.

Premature separation of a normally implanted placenta occurs as a result of delayed rupture of the amniotic sac, traumatism, nephritis, eclampsia, infectious diseases, and of all the conditions which produce abortion.

Symptoms.—Hemorrhage: internal when the blood accumulates behind the placenta, external when it makes its way into the cervix past the loosened edge of the ovum. The condition is extremely dangerous.

Treatment.—If the cervical canal is at least partially dilated immediate delivery should be effected either by forced labor (*accouchement forcé*), colpeurynter, or by Cesarean section; if the uterus is atonic and the hemorrhage cannot be controlled by hot injections, tamponade or the exhibition of ergot may be resorted to.

§ 23. ANOMALIES IN THE LABOR-PAINS.—INTERDEPENDENCE BETWEEN LABOR AND DISEASES OF OTHER THAN THE SEXUAL ORGANS.

For the purely functional anomalies of labor-pains it is often impossible to demonstrate any local anatomical cause, and they must, therefore, be classified among the disturbances of innervation and metabolism, except in those cases in which a distinct constitutional or other organic disease can be demonstrated.

GENERAL REMARKS ON DIAGNOSIS AND INDICATIONS FOR OPERATION IN DYSTOCIA.

So far the discussion has been limited to the purely anatomical disturbances of pregnancy and labor, which, for diagnostic purposes, may be grouped schematically, according to causes, as follows:

I. Abnormal resistance on the part of the mother.
(1) Contracted pelves.
(2) Stenosis, malformations, arrest of development or tumors of the soft parts.
II. Abnormal resistance on the part of the fetus.
(1) Unfavorable presentation, position, and attitude of the fetus.
(2) Malformations of the fetus (hydrocephalus, tumors, teratomata).
(3) Anomalies in the shape, contents, and position of the fetal membanes, and of the umbilical cord.
III. Abnormally diminished resistance on the part of the bony and of the soft tissues of the birth-canal on the one hand, and of the child on the other hand, when the expulsive forces are normal or increased—producing transverse position of the head or precipitate delivery.

We now have to discuss another group, which includes simple functional disturbances of labor due either to anomalies in the abdominal pressure and in the force of the labor-pains, or to constitutional diseases or other defects of the entire organism. Accordingly, we have:

IV. Functional disturbances of labor by
(1) Anomalies of the labor-pains.
(2) Other diseases of the mother.

Operative interference is indicated only when the sequels of these anomalies distinctly threaten the life of either mother or child. These sequels and symptoms indicating operative interference we have found to be the following:

A. On the part of the mother:

I. Symptoms in the genital tract.

(1) Excessive distention of the lower uterine segment; upward displacement of the contraction-ring from a hand's breadth above the symphysis to the level of the umbilicus or higher; presence of pain during the intervals between the uterine contractions; small and weak pulse.

(2) Rupture of the uterus (see § 20*a*) with complete escape of the child into the abdominal cavity: symptoms of shock, recession of the presenting part, and hemorrhages from the genitalia.

(3) Impending rupture of an ectopic gestation-sac (§§ 15*b*, 17) or of a cyst (§ 16*d*, or of a hematoma or thrombus in the vulva, § 21*c*, especially during the birth of a twin), or of an excessively dilated bladder, as in the case of an incarcerated retroflexed uterus (§ 21*b*).

(4) Impending perforation from erosion, localized pressure-necroses (§ 20*b*), lacerations of the vagina and perineum (§ 20*d* in conditions of rigidity, stenosis, and funnel-shaped pelves, indicated by pallor of the frenulum).

(5) Marked pain in the pelvic joints, a sign of impending laceration of the joint capsules (contracted pelves, § 18).

(6) Acute inversion of the uterus (§ 23, No. 1).

(7) Hemorrhages in placenta prævia, premature separation of the placenta, retained placenta, atony of the uterus after labor, and with the above-mentioned injuries.

II. General symptoms.

(1) Infectious intoxications with fever or comatose or hectic conditions: (*a*) Sepsis with a temperature of 100.4° F. (38° C.), pulse 100 and over, from local injuries of the genital tract or the decomposition of a fetus. (*b*) Eclampsia (see § 13). (*c*) Tuber-

culosis (§ 14); the prognosis in labor is often serious on account of the loss of blood and the muscular strain, hence artificial termination of labor and anesthesia are indicated in the second stage. On the other hand, pregnancy itself usually runs a favorable course.

(2) Other organic diseases unfavorably influenced by labor, for instance, cardiac lesions (§ 14), which, according to Fritsch, are apt to bring on cardiac paralysis and pulmonary edema on account of the increase in the blood-pressure due to the labor-pains. Extreme debility and anemia.

B. Symptoms on the part of the fetus.

(1) Persistent retardation of the fetal heart-sounds down to 100 or less, or persistent acceleration to 160 or over, with decrease in the force of the impulse. Funic souffle.

(2) Passage of meconium.

(3) Prolapse of the umbilical cord (§ 22).

(4) Hemorrhages from fetal placental vessels in velamentous insertions or in placenta prævia (§ 22).

1. Anomalies in the Labor-pains.

(*A*) *Increase in the Force of the Labor-pains.*—**Tetanus uteri** (Wehensturm) occurs when the resistance is insuperable, as in transverse presentations after discharge of the amniotic fluid, and particularly after protracted, ill-advised attempts at delivery, or after the exhibition of ergot during labor. These tonic contractions, while they in no way assist the act of parturition, are very apt to produce rupture of the lower uterine segment and death of the fetus.

Treatment.—The labor is to be at once terminated in transverse presentations by means of embryotomy, the spasm of the uterus being first allayed by complete anesthesia or by the injection of $\frac{1}{4}$ gr. (0.015 gm.) of morphine with $\frac{1}{130}$ gr. (0.0005 gm.) of atropine. Very often, however, it is impossible to relax the uterus by giving an anesthetic if the contractions have already led to excessive dilatation of the lower uterine segment, besides, the danger of infection is increased by the administration of a narcotic when the temperature is elevated and the woman is much debilitated; in such cases, therefore, embryotomy is the proper procedure.

Spastic strictures result from the same causes that produce tonic spasmodic contractions, and, of course, occur only in situations supplied with sphincter-like muscles, as at the uterine orifices of the tubes and at the external os (see Figs. 64 and 65). They occur rarely during labor, as, for instance, in Kaltenbach's case, which is of medico-legal interest in that the stricture was situated in the region of the internal os and caused a constriction on the neck similar to that produced by a coil of the umbilical cord. Usually they occur during the postpartum period, and may in some cases produce retention of the placenta.

Treatment.—The condition calls for the administration of an anesthetic.

Analogous to this last variety of spasmodic contractions we have the partial convulsive labor-pains which occur not infrequently and affect various asymmetrical portions of the uterine muscle. Their effect is to exert unequal pressure on the fetus or ovum, so that labor fails to progress in spite of the apparent force of the contractions. The spasm is especially apt to occur in nervous and chlorotic women.

Treatment.—The treatment is the same as for atony of the uterus, to which the condition is closely allied; *i. e.*, narcotics or possibly a single profound anesthetization.

Abnormally vigorous labor-pains with lessened resistance in the birth-canal and fetus lead to precipitate delivery. The excessive force of the labor-pains is due to the presence of a hypertrophic substratum in the muscularis of the fundus, a condition which is not rarely hereditary. According to v. Winckel, an additional predisposing cause is found in multiple births and abnormal shortening of the umbilical cord.

Treatment.—The woman is placed on her side and forbidden to bear down. The perineum should be protected from the very beginning. If the condition changes to partial convulsive labor-pains anesthesia should be induced or a mustard-plaster applied.

(*B*) *Diminution in the Force of the Labor-pains.*—This may be:

(*a*) *Primary*, either as the result of a general weakness due to anemia, starvation, or disease in a debilitated woman; or as a result of defective development of the uterine muscle, be it physiological, on account of age (very young or very old primiparæ), or dependent upon defective involution, especially after premature labors, or upon malformations of the uterus (uterus bicornis, unicornis, see §§ 15 and 21), or upon tumors in the uterine wall.

(*b*) *Secondary*, resulting from abnormal distention (polyhydramnion, multiple pregnancy, etc.), loss of blood (placenta prævia), inflammatory disease (injuries and perimetritic adhesions of the uterus, hysteropexy), or, finally, from displacement of the uterus. Among indirect causes may be mentioned insufficient abdominal pressure during the second stage of labor and congestion and inflammation of the pelvic organs.

Diagnosis.—All these etiological factors must be carefully taken into consideration, and the force and duration of the pains and of the intervals accurately noted by the condition of the fundus, the progress of the presenting part, and the dilatation of the entire cervical canal. The bladder and rectum must be carefully examined and emptied if necessary. Finally, the general condition of the patient as to temperature and pulse must be determined, and after the discharge of the amniotic fluid the fetal heart-sounds should be counted.

Atony of the uterine muscle leads to dangerous postpartum hemorrhages.

Treatment.—This consists in stimulating the labor-pains by means of hot baths, by hot vaginal douches at from 93° to 100° F. (34° to 38° C.—a pailful of sterilized 0.6 per cent. salt solution or 0.25 per cent. lysol solution being injected every one or two hours), or by hot poultices, reaching from the fundus to the symphysis; in the administration of diaphoretics and stimulants, the patient being first thoroughly quieted and allowed to sleep, and the bladder and rectum emptied. If all these measures fail, and if the os fails to dilate and the head is already deeply engaged, a colpeurynter should be introduced. This is indicated especially in overdistention of the uterus due to multiple pregnancy or polyhydramnion, in which case the amniotic sac should also be punctured early; it is not so appropriate, however, in painful affections.

If labor does not terminate spontaneously, all the various operations for extraction may be considered: Manual expression of the fetus, after Kristeller, Fehling's and Ritgen's manipulations to hasten the delivery of the head (see *Atlas of Labor and Operative Obstetrics*), the application of forceps if the child's life is in danger or the mother becomes completely exhausted, and in the third stage of labor expression of the placenta after the uterus has become firmly contracted, either spontaneously or after half an hour's rubbing and kneading of the fundus and of the posterior wall, or, if the placenta is not delivered and hemorrhage occurs instead, extraction of the placenta. Ergot, ergotin, or cornutin may he given even in the expulsive stage if there is no abnormal resistance, providing immediate artificial termination of labor is not intended.

Such abnormal resistance is often due to secondary diminution in the force of the labor-pains, which will now be considered.

(*C*) *Secondary Diminution in the Force of Labor-pains.*—If labor is too long delayed, the child dies after the discharge of the amniotic fluid and there is constant danger of infection from the invasion of micro-organisms, hence artificial delivery is indicated, massage of the fundus being kept up. Ergot is to be administered at the moment of delivery.

If the atonic bleeding continues in spite of these measures—as may occur in hemophilia, arteriosclerosis, cardiac lesions, chronic nephritis, insufficient development of the muscle at the placental site—a hand should be introduced into the vaginal vault, the uterus bent over forward and kneaded between the two hands. In desperate cases the portio vaginalis should be drawn down to the vulva with Muzeux's tenacula and covered with sterile gauze. This procedure, by distorting and obstructing the uterine vessels, will stop the blood-supply and thus arrest the hemorrhage, while the increased amount of carbon dioxide in the blood brings on contraction of the uterine muscle.

A very serious but fortunately rare consequence of insufficient contraction of the lower portion of the uterus is

Inversion of the Uterus.—It occurs chiefly as a result of improper treatment during the third stage of labor, such as undue traction on the umbilical cord before the placenta is separated and manual pressure on the uncontracted uterus. It may be partial, invaginating the fundus in the shape of a funnel, or complete, in which case the spherical body of the uterus is forced through the internal os; the condition calls for immediate re-inversion or the introduction of a colpeurynter after the placenta has separated (see *Atlas of Gynecology*).

2. Interdependence Between Labor and Diseases of Other Organs.

The most important disturbances and dangerous complications occur in the presence of cardiac insufficiency and tuberculosis. In cardiac insufficiency without compensation and with degeneration of the heart-muscle (see § 14) death may occur suddenly during labor as a result of pulmonary edema and profuse dropsical effusions. In other cases the heart is arrested by cerebral or cardiac anemia secondary to venous stasis in the intestinal blood-vessels. During the third stage there is great danger of hemorrhage on account of the atony of the uterus. In the subsequent course of the puerperium there is an increased liability to infection on the part of the tissues on account of the disturbances to circulation and nutrition. A moderate postpartum hemorrhage relieves the patient and is not necessarily dangerous. If dyspnea occurs during labor (see the scheme in this section under Anomalies of Labor-pains) the woman is placed in a sitting posture and hypodermatic injections of camphor and ether are administered, or, if necessary, the amniotic sac is prematurely punctured.

If dangerous symptoms develop, the child should be extracted as early as possible, but not too rapidly. Anesthetization may be useful in some cases. Dilatation of the os is effected by means of the colpeurynter. Unless the postpartum hemorrhage produces alarming symptoms ergotin is contra-indicated; on the other hand, the application of a sand-bag to the abdomen is very useful. During the first four days of the puerperium ether may be given, after that digitalis or strophanthus.

The *prognosis* of labor and the puerperium in lung diseases (see § 14), be they acute, as croupous pneumonia or even influenza, or chronic, as tuberculosis, is very unfavorable. The consequences to be feared are postpartum hemorrhages on the one hand, rapid loss of strength and exacerbation of the systemic disease, and pulmonary edema on the other hand.

Influenza is often followed by septic infection (metritis, peritonitis) and the discharge of fetid lochia, even in cases in which there has been no vaginal exploration nor even support of the perineum during labor. Similar danger exists in the case of erysipelas, and the prognosis of labor is even more unfavorable.

The sequels of *chronic nephritis* in the case of the parturient, and much more rarely of the puerperal, woman in the form of eclampsia and its treatment have been discussed in § 13, in connection with Premature Labor.

The influence of disturbances of innervation upon labor manifests itself in various ways, and is much more extensive and of more frequent occurrence than might be supposed from the cursory manner in which the subject is usually treated in text-books in the chapter on Anomalies of Labor-pains. Disturbances in the form of simple neuroses are of serious import for two reasons: either they may, like hyperemesis gravidarum, be followed by serious consequences to the child and occasionally to the mother; or, on the other hand, they may, by simulating alarming symptoms, induce the beginner to resort prematurely to active interference and thereby expose the woman to the dangers of injury. Again and again men of the widest experience, like v. Winckel, who learned their profession during a period when any form of unnecessary interference was discountenanced, have insisted that every beginning practitioner should seize every opportunity to observe physiological labors as accurately as possible, and this dictum still retains all its force even in these days of antisepsis, anesthesia, and improved technique. Accurate recognition of any deviation from the physiological process during labor is the only protection against harmful interference, especially now that we have acquired a knowledge of the nervous phenomena.

Among the causes of functional anomalies in the innervation the author has, above all, observed alterations in the type of the labor-pains. In addition to the subjective symptoms of increased pain, localized especially near the sacrococcygeal extremity or in one horn of the uterus, the effects of such nervous disturbances manifest themselves objectively in the diminution of the force of the contractions. In neuropathic individuals not suffering from any special gynecological disease very painful gestation pains often make their appearance during the last six to ten weeks, occurring usually at night, associated with profuse sweating. During parturition, which may be premature or abnormally delayed, the severity of the pains becomes abnormally increased, and the contractions, which are manifestly asymmetrical and may even partake of the partial tetanic type, fail to bring about sufficient dilatation of the external os, which is often delayed for hours or even for days without any apparent reason. Premature rupture of the amniotic sac without endometritic symptoms is a very common occurrence. If the abdominal walls are relaxed, the head may become lodged in a sacculation and be completely arrested above the superior strait, in spite of the vigorous contractions of the uterus lasting for hours or even days. This probably occurs only in multiparæ: the cervical canal offers an obstinate resistance to the dilating force for twelve or even twenty-four hours, although after version has been performed it distends readily enough; there is no true stricture at the internal os. Even during the expulsive period the progress of labor may be arrested if the os fails to dilate and is forced down into the interspinal line by the pressure of the head, which is unable to perform complete rotation. This complication of persistent transverse position of the head is partly dependent on stenosis or, at least, rigidity of the lower portions of the birth-canal and is, therefore, particularly liable to occur in elderly primiparæ, with vaginismus or with coiling of the umbilical cord. In addition, other clonic and tonic muscular spasms (gastrocnemius) and frequent reflex attacks of vomiting, ptyalism, hyperidrosis, anidrosis, severe attacks of migraine and neuralgia, may occur during pregnancy and labor. The author has observed a whole series of local and reflex nervous symptoms in a multipara during several successive deliveries. During the height of the labor-pains, which were unduly protracted, clonic fibrillar contractions of the extremities and tic convulsif made their appearance; in another multipara the labor-pains during several deliveries were accompanied by deep-seated, continuous, spasmodic sacral pains and by stenocardia and pain in the subscapular region. Temporary sciatica and neuralgia of the obturator nerve are not infrequent. The nervous symptoms are apt to be exaggerated during influenza.

On the other hand, labor-pains may come to a complete standstill either before or after complete dilatation of the os, especially after premature rupture of the membranes. A concomitant symptom is "atony of the abdominal pressure," which is partly dependent on hysterical abulia.

After the birth of the child we often observe excessively distressing afterpains, and in primiparæ sometimes a constant soreness of the coccyx which may last for several days. In the third stage irregular pains of partially tetanic and constricting character lead to unequal separation of the placenta or to its retention within the body of the uterus. Excessive afterpains may be hereditary and have been observed to occur in several generations (Skutsch); the author observed a case of this kind which was associated with migraine.

This mixture of hyperesthesia, atony, and partial tetanic phenomena extends to the adjoining organs, as the bladder, for instance. Catheterization during labor and the puerperium is extremely painful, so that occasionally ischuria may persist an entire week in spite of every attempt to relieve it (hot applications and douches, psychical suggestion), and in the absence of all objective findings. Similar phenomena come to the notice of the gynecological operator. This brings us very near the domain of disturbances of the central nervous system which may lead to psychoses resembling hysterical manifestations.

Multiparæ with defective innervation of the abdominal parietes and of the pelvic organs often suffer from lochiometra during the first days of the puerperium and, occasionally, from fever lasting twenty-four hours; the amount of blood and secretion discharged is increased, while, on the other hand, the milk secretion often fails to appear or disappears suddenly, and the abdomen becomes swollen. In this connection we must also refer to the marked individual variations in the frequency of the pulse during the puerperium.

When we come to pathological alterations in the domain of the nervous system susceptible of objective demonstration, as neuritis, multiple neuritis, and myelitis, etc., we find that their consequences are very much better known. In myelitis with total loss of the power of motion and sensation in the lower extremities, the complete development and expulsion of the fetus have been repeatedly observed without the occurrence of any subjective sensation of pain and without the exertion of the abdominal muscles, and this also has been frequently confirmed by physiological experiments.

The clinical picture of neuritis gravidarum and puerperalis is the same as that of any other neuritis: complete or partial loss of motor-power with atrophy of the muscles, tenderness of the nerve-trunks and paresthesiæ, especially a feeling of numbness in the fingers and toes and distressing formication. Occasionally multiple neuritis and hyperemesis make their appearance toward the end of pregnancy in combination with hemorrhages from the uterus. The possible causes are:

(*a*) Mechanical pressure naturally showing itself only in the lower extremities after difficult extractions;

(*b*) Intoxications, including auto- or metabolic intoxications, which often occur during pregnancy and may be associated with hyperemesis, and infections which gradually extend to all the nerves and in which the prognosis is very unfavorable. Possibly a further cause may be found in the excessive use of disinfectants. The *treatment* consists in baths and massage during gestation, and in electricity, but only during the puerperium. Windscheid even goes so far as to suggest the induction of premature labor in severe cases. The same rules of treatment apply as in hyperemesis.

CHAPTER VIII.

GENERAL REMARKS ON EXPLORATION FOR PURPOSES OF DIAGNOSIS AND TREATMENT.

A SCHEME of the various dangers to mother and child during labor constituting an indication for operative interference has been given in § 23.

The general rules to be observed in preparing the patient are described in § 2.

§ 24. PREPARATION OF THE PATIENT FOR EXAMINATION AND INSTRUMENTAL DELIVERY.

If the physician is called to attend a labor in which he has any reason to suspect one of the above-described complications, he should at once take the woman's temperature. Meanwhile he should make his inquiries in regard to age, the possible occurrence of rachitis during infancy, or the presence of any other organic disease which might affect labor, the course of former deliveries, the date of the last menstruation, and the course of the labor which he is about to attend. He next proceeds to confirm and supplement the information he has obtained by means of objective examination (see § 2), paying particular attention to the condition of the bladder. Internal examination must be preceded by careful disinfection, according to the rules given in § 2.

In the mean time the nurse should scrub the vulva, first with soap and then with a 1 per cent. lysol or 3 per cent. carbolic-acid solution, and, if necessary, shave the perineum and the lower half of the labia, and evacuate the rectum, unless it has been previously emptied. This should be done if possible with the woman lying crosswise on the bed. Next the catheter is introduced and the vagina flushed out and thoroughly rubbed with a 1 per cent. solution of lysol after the nurse has once more carefully cleansed her fingers with a brush. The cleansing of the vagina may be omitted unless an internal examination has been made by some one else or the vaginal secretion has a suspicious odor and a slightly viscid consistency.

Instruments, catheters, glass tubes, etc., are to be carefully boiled and then placed in a 3 per cent. solution of carbolic acid. Zweifel's douche-bag is placed in the same solution.

The following articles should be laid out in readiness: Two basins for the use of the physician to wash and disinfect himself, one basin with carbolized water for the instruments, one vessel to boil the instruments, clean towels and bed-sheets, one pail and another basin or other vessel instead of an irrigator for the douche-bag. Every receptacle to be thoroughly boiled.

Uterine irrigations after delivery with 2 to 2½ per cent. carbolic-acid, or 1 per cent. lysol or cresol solution, are performed with the aid of a speculum in the portio vaginalis, and a two-way catheter

(Fritsch-Bozeman). They are to be practised, however, only if the possibility of infection is suspected on account of previous examination or of operative interference. The point of the catheter is guided with the finger until the fundus is reached—*i. e.*, beyond the contraction-ring, which must be carefully felt for. The tube of the catheter should not contain air, but should be filled with sterile water, and the antiseptic solution is not to be poured in until the operator is certain that a continuous flow is established. In the same way the entrance of air should be guarded against at the end of the irrigation.

The physician now makes a careful examination of the pelvis, ascertaining its form, the extensibility of the soft parts, especially the degree of dilatation of the os, the position of the child, and the progress made by the presenting part; for instance, in what diameter of the pelvis the sagittal suture is found, whether the anterior or posterior fontanel is deeper, or whether there is a presentation of the posterior parietal bone, etc., and, finally, whether there is any danger for mother or child (see § 23).

So-called diminution in the force of the labor-pains is rarely an indication for the use of forceps.

We have, therefore, three questions to answer: (1) Is there any indication for interference? (2) What operation is indicated? (3) Has the proper moment arrived? The proper moment is determined by the position of the head and the degree of dilatation of the os. Internal version, forceps, and craniotomy require a dilatation sufficient to allow the passage of the presenting part, and if that degree of dilatation has been reached, the time for operation has come. The application of forceps is indicated if the head is firmly fixed; craniotomy only when the head has descended far enough.

All operations are to be performed with the most scrupulous antiseptic precautions, and with the patient lying crosswise on the bed with the legs supported on two chairs and the back well raised by means of pillows, or on a table. The woman is placed in the lateral position only when version is to be performed, on the side corresponding to the position of the feet. If the woman is lying on her left side, the operator uses his right hand for internal manipulation, introducing it at the end of a labor-pain.

The chloroform is dropped at regular intervals on the inhaler until narcosis is complete, and the woman is then kept on the boundary-line between anesthesia and consciousness. The bladder must be emptied before the beginning of the operation.

§ 25. THE INSTRUMENTARIUM.

The instrument-bag should be made of some material which can be readily disinfected, such as canvas or metal, and contain two compartments, one of which (*A*), also made of canvas, contains the drugs and the smaller instruments, including those which need not be disinfected, while the other (*B*), which can be sterilized, being made of metal or linen, after Fritsch's method, contains the instruments which require sterilization.

A contains:

Suturing Apparatus.

1. Needles: several strong, curved needles in a tin box.
2. Needle-holder.
3. Silk sterilized in steam and kept in envelopes or boiled in 5 per cent. solution of carbolic acid and kept in alcohol. Silkworm gut in carbolic acid.
4. Catgut sterilized by dry heat or in oil of juniper and kept in alcohol.
5. Tenaculum forceps.
6. Several pairs of forceps with a sliding catch (Schröder).
7. Several Köberle forceps or small hemostatic forceps (Péan) or clamp forceps.
8. A Déchamps needle, curved and provided with a handle.

Surgical Instruments.

9. Scalpel.
10. A probe-pointed bistoury with a long handle.
11. A pair of Cowper's curved scissors.
12. A pair of long, heavy Siebold's scissors.
13. A pair of forceps 1 foot (30 cm.) long.
14. A Cusco or Sims' speculum.
15. A curette.
16. A razor.
17. Two bullet forceps.
18. Two long, heavy hemostatic forceps (clamp forceps).

Anesthetics.

19. 4 fl. oz. (150 gm.) chloroform in a dark bottle.
20. An Esmarch inhaler.
21. A pair of delicate Muzeux forceps or other tongue forceps.

Tamponade and Dilatation.

22. A thin-walled colpeurynter.
23. Iodoform gauze, 10 to 20 per cent.
24. Salicylated cotton.
25. A pair of long dressing forceps.

Infusion.

26. A heavy infusion needle with rubber tube and funnel, or a syringe.

27. Several packages containing 0.6 NaCl or Feis' tablets.

Antiseptic Preparations.

28. 1½ oz. (50 gm.) liquid carbolic acid in alcoholic solution.

29. Twenty tablets 0.5 sublimate (Angerer's or Pieverling's hydrarg. oxycyanat. tablets); spiritus vini rectif. (alcohol).

30. 1 oz. (25 gm.) lysol for 1 per cent. lysol solution, instead of vaseline.

31. A glass graduated up to 1 fl. oz. (30 gm.).

Various Drugs.

32. Camphor.

33. 2 fl. oz. (50 gm.) æther. sul.

34. Morphine hydrochlorate (3 gr. [0.2 gm.]: 160 ♏ [10 gm.] of water); syringeful = ⅓ gr. (0.02 gm.) morphine + atropine.

35. ½ oz. (15 gm.) chloral hydrate, divided into ten powders.

36. 2 fl. oz. (50 gm.) tincture thebaica (20 to 30 drops a dose).

37. Ergotin or cornutin.

38. 2 per cent. solution argentic nitrate.

39. 2 fl. oz. (50 gm.) liquor ferri sesquichloridi.

40. Mustard leaves.

Various Instruments, etc.

41. Stethoscope.

42. Thermometer.

43. Two nail-brushes.

44. One elastic Charrière catheter, No. 12.

45. Rubber apron.

46. Tape-measure.

47. Towel and soap.

B contains:

Obstetrical Instruments.

1. A Nägele's forceps.

2. Cranioclast or cepnalotribe.

3. A Nägele's perforator.

4. A Mesnard-L. Winckel's bone forceps.

5. A loop of wide, heavy silk tape (round cord, after Ziegenspeck, is the best).

Irrigation, Injection, and Catheterization.

6. Irrigator with rubber tube or Zweifel's douche-bag.

7. Rectal tube.

8. Vaginal tube of glass with slight curvature.

9. Fritsch-Bozeman's uterine catheter of large caliber.

10. Two medium-sized elastic male catheters (Nos. 9 and 10).

11. A silver female catheter.

12. A Pravaz syringe.

Between these two compartments, that is to say, in the body of the bag itself, a Baudelocque-Martin's pelvimeter is stowed (see Fig. 43), or a Gömann's collapsible pelvimeter. If necessary, the large cranioclast and the cephalotribe may also be placed in this part of the bag.

Prussian[1] midwives must have the following articles in their bags in addition to their personal toilet articles:

An instrument-case with 1, 3 oz. (90 gm.) liquid carbolic acid; 2, a graduated glass to measure ½ oz.

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[1] The bag of the Bavarian midwife contains in addition a second vaginal glass tube, a rectal tube made of hard rubber, a medium-size rectal syringe, an elastic female catheter, a rubber nipple with a glass base, 1 oz. (30 gm.) of ether, tincture of cinnamon, oil of almonds, a fillet for performing version, tampons of salicylated cotton in bulk. On the other hand, it does not contain soap and towel, a metal rectal tube, Hoffman's anodyne drops, and silver-nitrate solution.

and 1 oz. (15 and 30 gm.) carbolic acid; 3, soap, nail-brush, and towel; 4, an irrigator of one quart (liter) capacity with a mark at 1 pint (½ liter) and provided with a rubber tube from 1 to 1½ yds. (1 to 1.5 meters) long; 5, a glass tube for the vagina; 6, a metal rectal tube; 7, a metal female catheter; 8, a cord cutter; 9, a narrow linen tape ⅕ in. (0.5 cm.) wide for tying the umbilical cord; 10, a package with twelve balls of clean cotton, the size of a hen's egg, tied with a thread and preserved in white parchment paper and the whole in a bag of some white material; 11, vaseline; 12, Hoffman's anodyne; 13, dark glass medicine-dropper with 2 per cent. argentic nitrate solution; 14, clinical thermometer; 15, bath-thermometer.[1]

The instruments are sterilized before and after use by boiling them for from fifteen to thirty minutes in a 3 per cent. carbolic-acid solution, or they may be sterilized by dry heat up to 302° to 338° F. (150° to 170° C.).

CHAPTER IX.

PATHOLOGY OF THE PUERPERIUM.

§ 26. PUERPERAL FEVER.

Owing to the peculiar mode of introduction and propagation of micro-organisms, puerperal infections present certain characteristic clinical pictures which depend on alterations in the circulatory apparatus, on the presence of definite lesions, and of typical physiological wounds and their secretions. These clinical pictures are very complex and their classification from either the anatomical or the bacteriological standpoint is somewhat difficult. While giving the usual scheme of classification, I shall confine myself in the text to the description of the clinical pictures which are most commonly observed at the bedside.

The cause of puerperal fever is found in the invasion of the excoriated cavities of the genitalia by pathogenic bacteria, although other predisposing causes, such as cold, dietetic errors, emotional excitement, and hemorrhage may indirectly assist the invasion and extension of the micro-organisms by diminishing the resisting-power of the body.

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[1] It is often important for the physician to know what he can find in case of necessity in a midwife's bag, but it is to be remembered that any operator who really desires strict antisepsis will often be very skeptical as to the condition of the contents of such a bag, especially as the midwife is required to supply the materials herself in pauper practice. In Baden a law has recently been passed which requires midwives to get all their drugs and tampon material from the drug-stores.

Anatomical Classification.

(1) Ulcers on the vulva, vagina, and portio vaginalis.
(2) Vulvitis, colpitis, acute simple endometritis.
(3) Acute metritis and salpingitis.
(4) Paracolpitis and parametritis, pelvicellulitis.
(5) Perimetrosalpingitis, peritonitis.
(6) Phlebitis, metrophlebothrombosis.

Bacteriological Classification.

(1) Pyogenic organisms in the secretions of the uterine cavity.

(2) Micro-organisms are found on the excoriated surfaces (grayish ulcers).

(3) The micro-organisms are found in the mucous membrane.

(4) The micro-organisms penetrate through the deeper lymphatic vessels into the connective tissue (parametritis).

(5) Infection of the tube or of the peritoneum through the same channels (peritonitis).

(6) The micro-organisms themselves find their way into the circulation and spread to the entire body (general septicemia).

(7) The products of the micro-organisms (sepsins and ptomains), especially of the microbes of putrefaction, find their way into the vascular channels (sapremia).

(8) Infection of the venous thrombi with secondary pyemic emboli in the circulation (pyemia).

(9) The principal bacteria concerned in these various forms of disease are the Streptococcus pyogenes, Staphylococcus aureus and albus, Bacterium coli, the pneumococcus and gonococcus, the tetanus bacillus, and saprophytes.

Clinically, we distinguish the following conditions:

(1) Ulcers of the vulva, vagina, and portio vaginalis.
(2) Acute simple puerperal colpitis and endometritis.
(3) Metritis and parametritis (paracolpitis).
(4) Metrolymphangitis, or salpingitis, and peritonitis.
(5) General fulminating puerperal septicopyemia.
(6) Sapremia.
(7) Metrophlebothrombosis and pyemia.

(1) **Puerperal Diphtheritic Ulcers of the Vulva, Vagina, and Portio Vaginalis.**—*Diagnosis.*—The ulcers correspond in position with the sites of the most frequent lesions during labor, *i. e.*, the nymphæ, the posterior surface of the vestibule, the lower portion of the vagina, the vaginal vault, and the external os. The excoriations and

fissures begin to secrete a thin pus during the first twenty-four hours, the floor of the ulcers is covered with a yellowish-gray exudate, and the edges become inflamed and painful. The affected parts are edematous. In rare cases a phlegmonous condition develops and a deep abscess is formed in the connective tissue. Phlebectasia and gonorrhea are predisposing factors.

Symptoms.—Pain and burning sensation during micturition, fetid lochia, remittent fever with chills, ischuria. A careful inspection should be made.

Treatment.—If there is any reason to suspect purulent endometritis before labor, the vagina should at once be irrigated with a 3 per cent. solution of carbolic acid or a 1 per cent. solution of lysol as a *prophylactic measure.* If ulcers are present they must be touched with chloride of zinc or ferric chloride and dressed with itrol (silver citrate) or iodoform (iodoformogen and europhen), or compresses of aluminium acetate, or, if the granulations are flaccid, the old-fashioned turpentine dressing may be employed.

(2) **Acute Simple Puerperal Colpitis and Endometritis.**—*Diagnosis.*—On careful examination with the speculum the papillæ on the vaginal mucous membrane are found to be very prominent; the entire region is swollen, reddened, and bleeds on the lightest touch. The lips of the external os are swollen and edematous and covered with exuberant granulations which bleed at the slightest contact. The portio vaginalis and the cervical mucous membrane, which is also very hyperemic and secretes an abundant mucopurulent and bloody fluid, are covered partly with the ovulæ Nabothi, partly with prominent papules, which when incised are found to contain pus. In the rare cases that come to the autopsy-table the same condition was found in the mucosa of the body of the uterus, especially at the placental site. The whole mass of swollen mucous membrane can be readily separated from the edematous but well-contracted muscular layer, and is found to be full of ecchymoses.

Symptoms.—The lochia are often fetid and streaked with blood; the fever is quite high and remittent in character, short chills alternating with a feeling of heat; afterpains are severe and persistent; the uterus is slightly, the abdomen not at all, sensitive. Later there may be hemorrhage on account of incomplete involution of the placental site, and the condition may go on to chronic endometritis and uterine displacement.

Etiology.—Injuries; the existence of catarrh previous to gestation; faulty aseptic technique in *sub-partu* explorations; decomposing portions of the fetal membranes.

Prognosis.—The fever lasts from three days to a week with a tendency to relapses. The inflammation is apt to become chronic and there is danger of extension to deeper tissues or to the tube and the perimetrium. The condition is often complicated with subinvolution of the uterus, and may be followed by a whole series of gynecological troubles.

The *course*, as in all these diseases, depends on the virulence of the micro-organisms and the resisting-power of the genitalia and of the entire body to the action of bacteria.

Treatment.—Priessnitz compresses; ergotin; vaginal irrigation, repeated several times a day; mild laxatives (calomel gr. ss to iss [0.03 to 0.1 gm.] three or four times a day). If the hard and painful condition of the uterus persists, vaginal irrigations; intra-uterine douche, once repeated, with weak antiseptic solutions (not with sublimate); or cauterization with concentrated carbolic acid.

(3) **Acute Puerperal Metritis and Parametritis (Paracolpitis).**—By metritis is meant an inflammation of the perivascular and interstitial connective tissue of the muscularis, originating in excoriations or ulcers in the uterine cavity, and directly caused by the Streptococcus pyogenes. The inflammatory process spreads to the connective tissue outside of the uterus, and from that point successively involves the tissues by the side of the bladder and the extraperitoneal connective tissue in the abdominal walls,

or even of the upper part of the thigh, or it may spread laterally between the two layers of the broad ligament to the iliac bones, or extend backward behind the peritoneum, pushing up Douglas' pouch and involving the psoas muscles or even the kidneys.

These processes are included under the terms *parametritis* (Virchow) or *pelvic cellulitis* (phlegmon of the pelvis, pelvic exudate), and consist in a gelatinous swelling and round-celled infiltration of the connective tissue (see illustration in *Atlas of Gynecology*). A mass of exudate which often attains the size of a man's head gradually accumulates, usually to one side of the uterus and later slowly undergoes absorption, leaving firm indurations in the parametric connective tissue, which later produce pathological fixations and displacements of the organ. While this is the usual course, the exudate may break down and the pus may be discharged into the rectum, into the vagina, into the bladder, through the ischiatic foramen along the inguinal canal, or directly through the abdominal wall above Poupart's ligament. Recovery then takes place unless the peritoneum has given way, in which case fatal peritonitis develops. Occasionally the process involves the opposite side secondarily.

Symptoms.—During the first week after labor there is generally considerable fever with chills and abdominal pain. In a few days, as the exudate accumulates, the patient complains of pain in the loins and kidneys and of pain and loss of power in the leg; urinary symptoms are sometimes present (paracystitis). The lochia are often fetid and may become bloody again owing to the subinvolution of the uterus. The fever gradually assumes a remittent and then an intermittent type with frequent relapses. If the fever becomes hectic and frequent chills take place, it is a sign of abscess-formation; as soon as perforation occurs the fever disappears.

Diagnosis.—As soon as fever and pain make their appearance the sensitiveness of the abdomen and the condition of the lochia must be carefully examined. The pain in the abdomen may be circumscribed if there is a local irritation of the serous membrane, but the entire surface of the abdomen is never painful and tumid nor is there any peritoneal exudation. On the other hand, it is often possible from the very first to detect an area of tenderness and later of resistance to one side of the uterus, until finally a tumor of doughy consistency is distinctly palpated. The vaginal vaults and the portio vaginalis become obliterated.

The diagnosis is somewhat simplified by the fact that the exudate does not spread along the peritoneum, but downward along the vagina or to Poupart's ligament. For the differential diagnosis from tumors in the pouch of Douglas, see under Ovarian Cysts, Extra-uterine Pregnancy, Myomata.

Prognosis.—The prognosis is rarely unfavorable as to life, although from six to eight weeks usually elapse before the woman recovers. If an abscess forms, as happens in about 15 per cent. of all cases, the pain is intense and, owing to the severity of the fever, loss of strength is extreme and convalescence very slow. If the woman is delicate, it is better to tell the family at once that the patient will probably have to be confined to her bed for months.

Treatment.—If the abdomen is very painful, ice-bags, Priessnitz compresses. Absolute rest in the dorsal position. Enemata; calomel several times a day, from gr. viij to xxiv (0.5 to 1.5 gm.); castor oil. To promote absorption: inunctions with mercurial ointment, gr. xv (1 gm.) of the ointment mixed with an equal amount of vaseline every two hours until salivation is produced, or potassium-iodide ointment may be substituted. The fetid lochial discharges and the ulcers on the vulva or portio vaginalis, if any are present, are to be treated in accordance with the principles laid down under acute endometritis. Fluctuating abscesses in the abdominal wall, in the vagina, or in the rectum should be opened;

in the latter, with the aid of a trocar. In addition lukewarm or warm baths should be given; the diet should be light but nutritious. If there is diarrhea, bismuth subnitrate and morphine or thebaine are indicated; the last-mentioned drug has a certain bactericidal action.

(4) **Septic Metrolymphangitis. Acute Puerperal Salpingitis and Peritonitis.**—In nearly all the cases the streptococci effect an entrance through grayish-yellow fissures and ulcers in the genital tract and in the placental site. The infection is usually unilateral and extends from the ulcerated endometrium through the swollen lymph-channels and enlarged and suppurating lymphatic glands into the muscularis and thence into the subserous tissue. The affected tissues rapidly break down and, along with the most prominent portion of the serous membrane, become necrotic, thus leading to peritonitis. The serous membrane is the seat of inflammatory hyperemia. The true pelvis is filled with masses of exudate; the bowels are filled with gas, and loops of intestine become matted together. The fluid exudate may spread beyond the cul-de-sac of Douglas; and gradually all the various organs of the body become involved in the infectious process: pleuritis and pericarditis develop. Occasionally the process remains localized near the spot where rupture of the peritoneum first took place, which is usually in Douglas' pouch (circumscribed peritonitis).

The virus also makes its way through the lymphatic channels to the ovaries, the walls of the tube, and the bladder, so that abscesses form in these localities. Rupture of an ovarian abscess may in this way give rise to peritonitis.

Finally, the virus may be conveyed to the peritoneum along an inflamed Fallopian tube—*i. e.*, by an endosalpingitis, the pus making its way into the abdominal cavity, usually on both sides: *pelveoperitonitis.* If, as sometimes happens, the abdominal opening of the tube is closed by adhesions, a pus-tube may form and rupture later on.

Symptoms.—The condition begins with a violent, protracted chill, which is soon followed by intense pain over the entire abdomen, elicited by movement, respiration, and by palpation, especially of the uterus, which is hard and enlarged. The congestion in the vessels of the head shows itself in flushing of the face and vertigo; later somnolence and delirium make their appearance, and may even go on to mania.

There is a rapid rise in the temperature accompanied by considerable acceleration of the pulse and of respiration. The presence of an exudate in the peritoneal cavity can often be detected by percussion as early as the first day. The abdomen is tympanitic and very much swollen on account of the great accumulation of gas in the intestines, due partly to the paralyzing effect of the fever on the muscular wall and partly to the intestinal inflammation. Tenesmus and vomiting also occur, as pressure is exerted on the diaphragm as well as on the abdominal walls; dyspnea soon develops and later becomes more marked as the pleura participates in the inflammation.

The secretions of the body are diminished in quantity; there is vesical tenesmus and the urine is concentrated and of high specific gravity. It may contain albumin. At first there is constipation, which later is followed by diarrhea. The lochia, which are also diminished in quantity, have a fetid odor and contain many pyogenic cocci, found in the decidua cells and in the blood-corpuscles. The milk secretion is also diminished in quantity.

If the lymphatic septic peritonitis runs this *acute* course, the crisis may occur within eight days and convalescence gradually begin, or the patient succumbs to the exhaustion. If the exudate is not absorbed and the patient lives, perforation of one of the hollow organs or of the parietal walls may take place, and the exudate be discharged; in this event secondary sloughing of intestinal origin may occur.

Circumscribed peritonitis runs a *chronic* course. The disease in the serous membrane progresses slowly, being constantly shut off from the rest of the peritoneal cavity by the formation of adhesions, just as in ovarian abscess. This form of peritonitis is described as *pyofibrinous.* It leads to pathological fixations and displacements of the uterus and to chronic inflammatory processes.

Diagnosis.—The presence of an intraperitoneal exudate is determined by percussion and rectal palpation, the diagnosis being confirmed by the existence of tenderness and swelling of the abdomen. The rupture of an abscess is detected by examining the urine, feces, etc.

For the differential diagnosis from parametritic exudation and retro-uterine tumors, see under Puerperal Parametritis, Ovarian Cysts, etc.

Treatment.—See below.

(5) **Fulminating Puerperal Peritonitis. Septicopyemia.**—If large numbers of very virulent germs suddenly penetrate into the peritoneal cavity, owing to rupture of the uterus, rupture of a pus-cavity, or the discharge of septic pus from the abdominal orifice of a tube, the course is so rapid that there is no time for an elevation of temperture; the patient immediately goes into a cachectic state, the pulse and respiration are enormously accelerated while the temperature falls. The symptoms are somnolence, rapid swelling of the abdomen with an enormous amount of exudation, pain, singultus, vomiting, diarrhea, and involuntary passage of urine and feces. The expression of the face is that of approaching dissolution, although the mind may remain clear and the patient be cheerful to the end. Death almost always occurs in from twelve to forty-eight hours. For the *treatment* see below.

(6) **Gangrenous Peritonitis. Sapremia.**—If, as a result of pressure-necrosis, a part of the uterus or of the fetus becomes gangrenous, or rupture takes place from an encapsulated focus of decomposition or from the intestine, the entire peritoneum breaks down into a brownish semifluid mass.

Symptoms.—Rapid development of meteorism, high fever, and somnolence. The condition usually follows a severe spontaneous or instrumental delivery complicated by localized pressure-necrosis.

TREATMENT OF ACUTE PELVEOPERITONITIS (METRO-LYMPHANGITIS AND SALPINGITIS).

As soon as tenderness develops in the abdomen and the intestines become distended, a Priessnitz compress should be applied. Calomel, gr. iss to v (0.1 to 0.3 gm.), and rectal enemata with vaginal and intra-uterine irrigations are indicated. The latter are to be avoided in salpingitis, lest tubal contractions be induced. If ulcers are present they should be cauterized.

If there are marked symptoms of peritonitis, such as increase in the exudate or excessive tenderness and vomiting, several ice-bags should be applied to the abdomen as long as the fever lasts. At first laxatives may be given, such as inf. sennæ comp. and calomel (at first gr. iij to viij [0.2 to 0.5 gm.], later gr. ¾ to iss [0.05 to 0.1 gm.] at a dose). For meteorism, fennel, hydrochloric acid, or sulphur internally, or oil of turpentine, ℥ss to j (15 to 30 gm.), per rectum. Profuse diarrhea may be checked with small doses of tincture of thebaine. To combat the vomiting, ice-pills and rectal infusions of normal salt solution. The diet should be liquid or semisolid: soup, milk, eggs, calves'-foot jelly, scraped meat, the various peptones and hemoglobin preparations, beef-tea.

The patient must be freely stimulated with brandy, egg-nog, champagne, claret (Runge gives large doses: f℥v [150 gm.] cognac, half a bottle of claret per day), in order to guard against excessive loss of strength and cardiac failure, but only when the patient is used to wine and beer. Other stimulants may also be given, such as camphor internally and hypodermatically, ether, bouillon. Diaphoresis should be promoted, and infusions of decinormal salt solution administered.

For pleuritis a mustard-plaster and dry cupping; for exhausting diarrhea, chlorine-water in an equal quantity of distilled water, one tablespoonful every two hours, and emollient beverages.

If the peritonitis is due to rupture of the uterus or vagina, the fetal portions that have escaped are to be removed and the wound drained with iodoform gauze. In this case opium may be employed.

If it is desired to supplement the administration of calomel by a general mercurial treatment, ʒij (8 gm.) of blue ointment mixed with an equal quantity of vaseline may be rubbed in every day until salivation is produced (gr. xv [1 gm.], every two hours for about a week). The same effect may be produced by the inunction of the silver salts in the form of ointments (Credé).

In the lymphatic form diaphoretic remedies may be employed with good results (Kehrer): aromatic tea with warm pack, camphor and liquor ammonii acetatis (the kidneys must be watched) with morphine and small doses of quinine or lukewarm baths; this must also be supplemented by alcoholic stimulation and nutritious diet. As soon as fluctuation is detected, and the wall of the vagina or of the abdomen begins to bulge, the abscess should be opened and drained with iodoform gauze.

TREATMENT OF GENERAL SEPTICEMIA AND SAPREMIA.

The treatment of septicemia consists in encouraging diaphoresis by means of baths at a temperature of from 80° to 88° F. (26.6° to 31.1° C.). The bath should last not longer than five minutes, the patient being carefully watched and stimulated with alcoholic beverages during and after the bath, as directed above. The food should be rich in albumin and easily digestible; ice and refreshing and cooling drinks should be given freely. In addition, decinormal saline solution should be injected. In sapremia the first thing to be done is to remove the focus of decomposition, the dead fetus or fetal remains, but without producing any new lesions. Before and after the operation the uterus should be irrigated with 3 per cent.

FIG. 159. **Puerperal Diphtheritic Endometritis and Colpitis.**—The thrombi at the placental site have undergone suppuration. Case of eclampsia (original water-color).

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digestible diet (every two hours) and by supporting the strength with cooling drinks and alcoholic stimulants, as explained in a preceding paragraph (*q. v.*). Alcohol is indicated, especially in cardiac weakness, which should also be combated by injections of ether and camphor, warm baths or warm packs after Priessnitz or Jacquet; for diaphoresis, cold sponging and douching.

To counteract the evil effects of decomposition of the thrombus, mercury, and possibly also the silver salts in the form of ointments have been found useful (see Treatment of Metrolymphangitis).

§ 27. INTERDEPENDENCE BETWEEN THE PUERPERAL PROCESSES AND OTHER DISEASES.

In the paragraphs on Pregnancy and Labor the alarming influence of certain diseases on the puerperium was mentioned (see §§ 14 and 33). The febrile infectious diseases, especially erysipelas, croupous pneumonia, and influenza must be regarded as serious complications of a puerperium, not only because of their effect on the general condition but also on account of the disturbances in the pulmonary circulation to which they give rise. The existence of a pseudoscarlatinoid form of sepsis has been alluded to in § 14. Influenza may act as the cause of the endo- or parametritis; the author is in a position to confirm the occurrence of excessively painful labor-pains and afterpains; anomalies in the lochial discharges which are reduced in quantity, of a purulent consistency and brownish color, and do not become fetid until the third or fourth day; rise in temperature, 102.2° to 104° F. (39° to 40° C.), without any marked acceleration of the pulse (108 to 120); and a tendency to marked diaphoresis, vomiting, meteorism, and diarrhea without peritonitis. Occasionally influenza becomes complicated with a streptococcal infection of the endometrium and the disease assumes a grave septic character.

Treatment.—Diaphoresis; laxatives; enemata, and rectal and vaginal irrigations; Priessnitz compresses on the abdomen and breast; salipyrin; very light diet, frequently administered in small quantities.

Cardiac disease without compensation and pulmonary disease not rarely lead to pulmonary edema and later to progressive

Tab. 72.

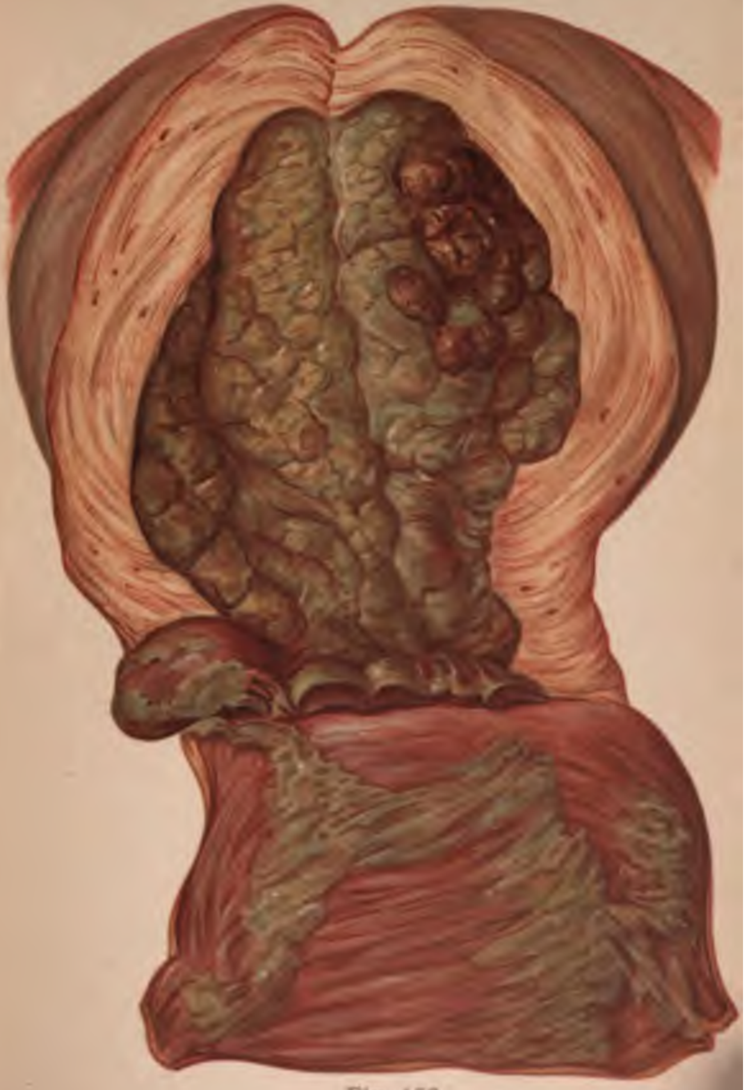

Fig. 159.

Lith. Anst F. Reichhold, Mün

miliary tuberculosis. The proper treatment should be instituted during the puerperium (see §§ 14 and 23).

Among nervous diseases we have already mentioned the occurrence during the puerperium of psychoses, which may or may not have been present before, especially melancholia with secondary anemia and the effects of chorea and myelitis. The *prognosis* of a psychosis depends on whether it is hereditary or not.

Diseases affecting the metabolism, and urinary diseases, including secondary amaurosis, are, as a rule, favorably influenced by the puerperium. Eclampsia rarely occurs in the puerperium and, if it does, runs a milder course; but this is not the case if the attacks continue after the expulsion of the child. Coma is occasionally followed by protracted loss of memory, by psychoses, and by amaurosis.

Tumors of the genital tract may become dangerous in various ways. A *myoma* will usually undergo involution; but, if the nutrition is disturbed, it may degenerate or decompose and produce most unfavorable conditions. *Ovarian cysts*, on the other hand, continue to grow and, as the pedicle is apt to be twisted or crushed, necrosis or decomposition is very likely to result.

Treatment.—Hemorrhages due to myomata are to be treated during and after labor as explained in § 23, No. 1, and later on in the puerperium with ergot or ergotin. Pedunculated polypi extending into the cervix or even into the vagina must be removed immediately after delivery on account of the danger of gangrene. Other tumors which are not readily accessible should be let alone. If they undergo decomposition they must be removed, and if this cannot be effected through the vagina, a celiotomy is to be performed, followed by total extirpation of the infected uterus.

If ovarian cysts are not complicated by torsion of the pedicle or suppuration or sloughing, nothing should be done until the end of the puerperium, but if such complications exist ovariotomy should be performed at once.

There is a wide field for the exercise of prophylaxis in the treatment of relaxed conditions of the abdominal and pelvic organs due to loss of elasticity and tonus in the striated and unstriated muscles, including, therefore, the walls of the vessels. The immediate consequences of this condition are postpartum hemorrhages from the flaccid uterus, which is usually much depressed and in a condition of retroversion. During the puerperium the hemorrhage manifests itself by the presence of blood in the lochial discharges, which retain their hemorrhagic character and become profuse. This appears to indicate a retention of the secretions in the relaxed uterus, a condition which I have already referred to under the name of lochiometra. The entire abdomen becomes distended with gas, the normal functions of the intestine and of the bladder are practically abolished often as long as one or two weeks after delivery, and the abdominal muscles become completely relaxed. Passive congestion in the entire abdominal distribution of the splanchnic nerve affects the

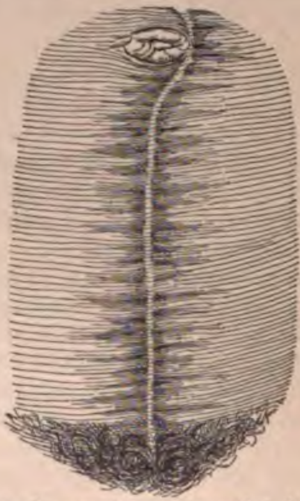

FIG. 19.—Abdominal scar after an operation for the removal of an ovarian cyst in the fourth month of pregnancy. Note the peculiar distribution of the pigment, corresponding with the sutures and the scar (from a case of the author's on the fourth day after a spontaneous delivery).

mammary glands to such an extent that milk secretion soon ceases or may even fail to become established.

The *ultimate result* of neglecting these conditions is permanent agalactia, distention of the abdomen—often associated with dysmenorrhea or lasting amenorrhea—backward displacement and descent of the uterus with congestion or inflammation and gastro-enteroptosis.

Treatment.—Abdominal massage, a tight binder to the abdomen, ergotin, the introduction of a pessary about the end of the first week, with proper attention to the regulation of the bowels (after the second day) and of the bladder.

§28. DISEASES OF THE MAMMARY GLANDS DURING THE PUERPERIUM.

Inflammation of the mammary gland, or **mastitis**, is a tedious and more or less serious, but rarely a fatal disease. It is due to the action of staphylococci and streptococci which make their entrance through minute solutions of continuity in the skin, usually fissures about the nipple; the cocci are also found in the ducts of the gland, but their virulence appears to be much attenuated. Either they establish themselves about smaller ducts and in the acini and set up inflammation and suppuration in them (parenchymatous mastitis), or they follow the course of the interlobular connective tissue (interstitial mastitis) or, finally, a retromammary abscess may form.

Symptoms.—Some difficulty is experienced in finding the fissures, which are usually hidden in the minute furrows between the glands of Montgomery. Sometimes they are very painful and are then found to be ulcerated and covered with an exudate.

From these excoriations a cord-like wheal extends to the nearest lobule, in which the inflammatory process manifests itself early by a tense hardness and increased sensitiveness to pressure. The surrounding skin becomes reddened; later edema develops and indicates the formation of a deep abscess. This is soon followed either by fluctuation or by the formation of minute fistulæ, beneath which there is an extensive suppuration. Owing to the plentiful supply of lymphatics in the organ the fever is very high—104° F. (40° C.) and over is nothing unusual. The occurrence of suppuration is usually preceded by a chill.

The individuals most predisposed are, of course, those of weak and scrofulous constitution, and the suppuration in these cases may, in spite of energetic treatment, gradually extend from lobule to lobule and may even involve the other breast. In some cases, which are fortunately extremely rare, general sepsis develops.

During the winter of 1898 to 1899 I observed a case of this kind for seven weeks. The mother was young and in very delicate health. There were old scars from the removal of lymphatic glands in the neck. The woman was in miserable circumstances and had been attacked by influenza shortly before her confinement. In spite of ice-bags, compresses, and early incisions, the entire glandular tissue of both breasts was gradually destroyed. The skin was undermined in both directions by small fistulæ, while several deep abscesses, varying in size from a walnut to an apple, had formed in the substance of the gland. It was evident that the tissues of the glands had lost all their bactericidal power.

Treatment.—The fissures about the nipple should be covered with cloths wrung out in aluminium acetate and the breasts emptied with a glass breast-pump, which may also be used as a precautionary measure in the other breast. The plan of hardening the nipples during pregnancy does not recommend itself to the author (see § 10), at least, not with brandy; daily washing with cold water or 30 per cent. tincture of nutgall may, however, be tried (Ahlfeld).

If inflammation has already developed in the surrounding tissue, the affected breast should be allowed to rest for a few days and dressed with compresses wrung out in lead acetate. The same treatment is employed if one of the lobes is distinctly hard. Compresses are wrung out in lead-water cooled with ice and changed every five to fifteen minutes. At the first sign of suppuration, such as edema of the skin, that is to say, very early, the breast is incised and drained, counter-drainage being established if necessary, and the wound irrigated through and through. Light, nutritious diet should be ordered, the bowels regulated, and measures adopted to promote diaphoresis.

Hypersecretion of the mammary glands manifests itself in *polygalactia*, *i. e.*, simple hypersecretion, and in *galactorrhea*, a condition in which the milk flows in an uninterrupted stream; it is evidently due to disturbance of the innervation. The *symptoms* at first are the same as those which attend prolonged lactation, dragging pains in the breast and back, feeling of oppression in the stomach, loss of appetite, visual disturbance, chlorosis, weakness. Before long, however, the symptoms of oligemia become more marked. The patient complains of palpitation of the heart, the pulse is small and rapid, oliguria, convulsions, and attacks of syncope make their appearance. The *treatment* consists in massage, compression by means of a bandage, iodine and sodium iodide internally.

§ 29. PRESCRIPTIONS COMMONLY USED IN OBSTETRICAL PRACTICE.

DRUG.	DOSAGE.	INDICATION.
1. Æther sulph.,	Inhalation.	Anesthetization; also during labor.[1]
2. Æther sulph. every 15 to 30 minutes,	10 minims — 1 syringeful.	As a stimulant in metrorrhagia, heart disease.
3. Airol, pulv. acaciæ, ãã ʒiiss; glyc., bol. alb., ãã ʒv.,	Paste.	Paint on perineal scars after suturing.
4. Alcohol: Cognac and red wine,	f℥v and half a bottle.	Puerperal fever (Remge). Caution!
5. Liq. alum. acet., 10 per cent.,	1 tablespoonful to 1 quart of water.	Vulvar pads in inflammatory conditions and for irrigation (1 teaspoonful to 1 quart of water).
6. Antifebrin,	gr. iv to viij, one to three times daily.	Puerperal fever. Parametritis. Typhoid.
7. Antipyrin,	gr. viij to xvj, one to three times daily.	Puerperal fever during pregnancy. Fever during labor.
8. Argent. nitr.,	2 per cent., 1 to 2 drops.	Ophthalmoblennorrhea neonatorum.
9. Argent. nitr., 95° to 99.5° F.,	0.1 per cent., in ℥v doses.	Injection in cystitis.
10. Argent. nitr.,	2 per cent. solution or ointment.	Irrigation in gonorrheal colpitis, or in ointment, to stimulate granulations of a perineal laceration.
11. Argent nitr.,	Solid stick.	Cauterization of puerperal ulcers.
12. Bismuth. subnit.,	gr. viij to xvj + morph., gr. 1/3, several times daily.	Diarrhea.
13. Potassium, or better, sodium bromide,	gr. xvj per diem.	Ptyalism. Psychoses.
14. Calcium phosph.,	gr. viij to xxx, several times a day.	Osteomalacia.
15. Calomel (hydr. chlor. mit.),	gr. ss to iss, three or four times daily.	Laxative in puerperal fever.
15a. Calomel,	gr. 1/12 to j, three times daily.	Lues neonatorum.
15b. Calomel,	gr. 1/6 to iss to iij, three times daily.	Syphilis of pregnancy.
16. Calomel[2] (vapore parat.),	gr. xv to ʒiij; ol. oliv., 4 to 6 Pravaz	in eight to ten days. Syphilis of pregnancy.
17. Bismuth. oxyiodidum,	. . . .	Syphilitic ulcers in pregnant women.
18. Empl. mercuriale,	. . . .	For dry syphilitic papules and instead of blue ointment during pregnancy.
19. Sublimate (hydr. bichlor. corr.) in tr. benzoini,	1 : 100.	For mucous patches during pregnancy.
20. Carbolic acid,	90 : 10 spir. vini. alk., 2 to 2½ per cent.	Uterine irrigation.

21. Catgut (dry and in sterile envelopes),	Hardened in 2 per cent. chromic acid.	Keep in alcohol.
22. Quinin. sulph.,	gr. iv to viij, two to four doses in the evening.	In puerperal metrophlebothrombosis, gr. xvj in atony of uterine muscle.
23. Aqua chlorata,	300 : 1000 c.c. of water.	Vaginal and uterine douche.
24. Chloral hydrate,	Up to gr. xlviij at a dose.	Anesthetization during labor.[1]
25. Chloral hydrate,	1 : 50 c.c. per rectum, after each attack, up to ʒiij per diem.	Eclampsia.
26. Chloral hydrate + syr. cort. aur., āā fʒss; aqu. dest., f℥vj,	1 tablespoonful three or four times a day.	In inefficient labor-pains, to diminish the local pain.[1]
27. Chinoidinum instead of iodoform,	. . . .	To encourage granulation in puerperal ulcers.
28. Chloroform, 100 : 200 c.c. ether; or 100:	ether, 30; alcohol, 30.	Anesthetization after Billroth.[1]
29. Chloroform, ♏xvj to ether ♏xxx.	Local application. Rub and cover with gutta-percha paper.	For labor-pains, sacral pain, etc.[1]
30. Chloroform, fʒj; ol. hyosc., fʒiij,		
31. Cocaine hydrochlor.,	Apply with brush five to seven times, 4 to 10 per cent.	Apply to cervical canal and vulva *sub partu*.
32. Cocaine, gr. iij in f℥iss water,	gtt. v, every four hours.	Labor-pains.[1] Hyperemesis. Tetanus uteri.
33. Cocaine powder,	gr. ½, three times.	
34. Tinct. cinnamomi,	gtt. x to xv.	As an adjuvant in inefficient labor-pains; atony.
35. Creolin solution,	¼ to 2 per cent.	Antiseptic uterine irrigation.
36. Inf. fol. digit.,	♏x to xvj : 100 c.c., for one day.	Cardiac lesions.
37. Formalin,	1 : 2 to 3 aqu., 1 tablespoonful in 1 quart of water.	Douche.
38. Lysol, 1 per cent., does not dissolve in	"hard" water; disinfects and	lubricates the vagina; is not poisonous.
39. Ergotin. dialysat.,	gr. ¾ hypodermically.	Insufficient labor-pains; atony; hemorrhage; retention of placenta.
40. Ergotin., gr. xl; aqu., f℥ss; ac. salicyl.,	¾ gr.; ½ to 1 Pravaz.	
41. Extr. secal. corn. aqu.,	Pills, gr. ¾ each.	Three to four times a day, with 10 drops of tr. cinnamomi.
42. Extr. secal. corn. aqu., gr. xxx to ʒj; and aqu., f℥vj,	1 teaspoonful every two hours, with 15 drops of tr. cinn.	Insufficient labor-pains; atony; hemorrhages; retention of placenta.
43. Secal. corn. pulv.,	gr. viij to xxiv per dose, three times in ten minutes.	

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[1] There is no perfect anesthetic for use during labor—that is, one which will bring about analgesia and still preserve the expulsive powers. The best is a mixture of laughing-gas and oxygen, in the proportion of one to four. Chloroform is the most effective when the os is almost completely dilated and while the head is distending the vulva (von Winckel), but although, according to Spiegelberg, the labor-pains act as a stimulant to the heart, it is hardly permissible to induce anesthesia, in view of the marked tissue changes in the heart-muscle, unless it is absolutely necessary. Ether is less injurious in the presence of cardiac disease, although it is contra-indicated in bronchitis.

[2] Calomel may be advantageously replaced by hydrarg. salicyl., gr. xv; ol. oliv., fʒiij, for injections in the gluteal region, because it is less likely to produce abscess.

DRUG.	DOSAGE.	INDICATION.
44. Inf. secal. cornut., f℥ss; aqu., f℥vj. with acids,	1 tablespoonful every fifteen minutes.	Hemorrhages; it is borne better than powders.
45. Hydrarg. bichlor. or oxycyanide,	1 : 1000 to 2000.	For disinfecting the hands.
46. Hydrarg. ung. ciner., āā vasel.,	gr. xlv to ʒij daily.	In septic puerperal fever.
47. Itrol (silver citrate),	Powder or ointment.	Local application in puerperal sepsis, and for dusting puerperal ulcers; non-irritant.
48. Iodoform or iodoformogen,	Powder.	
49. Iodoform pencils, ʒj to ʒiss; glycerin and gum arab., āā gr. x,	5 to 6 cm. long.	Insert into cervix in puerperal endometritis.
50. Iodol, dermatol, nosophen,	Powder.	Decubitus ulcers.
51. Ipecac,	gr. iss to v.	As an emetic in insufficient labor-pains.
51ᵃ. Dover's powder,	gr. $\frac{1}{20}$ to $\frac{1}{12}$, three times daily.	In diarrhea of infants.
52. Irrigation:	Hot, 117° to 122° to 128° F.	½ to 1 to 2 quarts into the uterus, in hemorrhage.
Irrigation douche,	Warm, 95° to 110° F.	To induce labor-pains in premature labor, may be alternated with cold.
Irrigation douche,	Cold.	In inversion of the uterus, and in bleeding vaginal lacerations.
Irrigation douche,	Ice cold.	In uterine hemorrhages.
53. Application of ice,	. . . .	(1) In hemorrhages: from lacerations of the cervix and vaginal vault; in the puerperium from extra-uterine pregnancy; in hematomata in the vulva. (2) Prophylactically: after obstetrical operations, especially after Cesarean section, artificial removal of placenta and remains of fetal membranes, after rupture of the uterus. (3) In infections: puerperal fever, parametritis, peritonitis, disease of the pelvic joints. (4) In inversion of the uterus.
54. Laxatives for gravidæ and puerperæ,	In repeated doses, after v. Winckel.	Daily high enema of ½ to 1 quart of tepid water, to which may be added salt, oil, glycerin, glycerin-soap (with an irrigator in Sims's position). Ol. ricin. per anum, or
	½ to 1 teaspoonful.	2 to 4 capsules by the mouth; pulv. magn. ust. or citr. effervesc. c. rheo; pulv. liquir. comp.; decoct. cort. rhamni frangul.; vinum sagradæ.

	2 tablespoonsful to 1 wineglass.	Bitter waters. Drastics are to be avoided during pregnancy.
	gr. ss to iss, three to four times a day.	Calomel (see *ante*) after rupture of uterus (to be followed by opium) and after repair of a perineal laceration.
55. Extr. rhei. comp., Extr. colocynth., āā ♏xl,	one to three times daily.	In eclampsia and other renal diseases, with warm baths, 100° F. and pack; milk diet.
56. Ol. terebinth.,	f℥ss to j, enema.	For meteorism; peritonitis.
Ol. terebinth., with ol. amygd.,	1 : 4.	For puerperal ulcers in vulva.
57. Tr. opii thebaica,	15 to 30 drops.	Tetanus uteri, impending abortion, after repairing a perineal laceration, in rupture of the uterus, puerperal fever (acts as a germicide in the intestine.
58. Tr. opii thebaica,	10 to 20 drops.	Injection in metrorrhagia.
59. Extr. mecon., gr. xl, Lanol., ℥ij; ol. oliv., f℥iij,	locally; cover with gutta-percha paper.	To allay pain during excessive labor.
60. Morph. hydrochlor., gr. iij; aqu., f℥iij (1 syringeful = gr. $\frac{1}{2}$).	gr. $\frac{1}{2}$, injected within four to seven hours, up to ♏iij (!)	In eclampsia; in labor complicated by contracted pelvis; in stricture of the uterus; after Cesarean section (see *Opium*).
61. Morph., gr. $\frac{1}{3}$; atrop., gr. $\frac{1}{8}$; aqu., f℥iij,	One Pravaz syringe.	In tetanus uteri; before anesthetization.
62. Morph. hydrochlor.,	gr. $\frac{1}{3}$, injection.	In extra-uterine pregnancy in fetal membrane.
63. Emuls. amygdal., f℥iij, Extr. hyoscyami, gr. x,	15 drops, three to four times daily.	In metrorrhagia.
64. Ol. hyoscyami, f℥vj. Chloroform, f℥iij.	Externally; cover with gutta-percha paper.	For sacral pain, etc.
65. Sod. iod.,	gr. ij to iv, up to gr. xv per day.	Syphilis during pregnancy.
66. Orexin. basic.,	In wafers, gr. v to viij, three times a day.	In hyperemesis.
67. Phosph. (see *Calc. phosph.*).		
68. Phenacetin,	gr. viij to x, per dose.	Puerperal fever, insomnia.
69. Ac. salicyl., gr. xlviij; amyl. trit., ℥ss,	. . . .	Puerperal ulcers.
70. Conc. alcoholic sol. of salicylic acid,	10 per cent.	To preserve laminaria tents; or they may be boiled from two to five minutes in carbolic-acid or in bichoride solution, or permanently kept in iodoform or sublimate with ether (v. Herff).
71. Sulphonal or trional, gr. xxx to ℥j	or gr. xv to xxx per dose.	Hypnotic.
72. Antimon. tartr.,	gr. $\frac{1}{8}$ to $\frac{1}{3}$ per dose.	As an emetic in insufficient labor-pains.
73. For digital examinations: 1 per cent. vaselin, or best of all, 1 per cent.	creolinmollin, or 10 per cent. lysol, which, however, is soluble	boroglycerinlanolin or 5 per cent. carbolized only in soft water.

EXPLANATORY NOTE.

Each illustration is provided with a description found at the top of the even page, above the main text. The reference letters and numbers in the descriptions are especially chosen for each illustration; but in addition to these, another set of numbers has been used in the description of the many sagittal sections and other illustrations of the pelvis, identical with the numbers used in the *Atlas of Labor and Operative Obstetrics.* They are the following:

1. Symphysis.
2. Promontory.
2*a*. Double promontory.
3. Coccyx.
4. Cervix.
4*a*. External os.
4*b*. Internal os.
5. Bladder.
6. Vagina.
7. Rectum.
7*a*. Anus.
8. Walls or body of uterus.
9. Spines of the ischium.
10. Tuberosities of the ischium.
14. Perineum.
16. Umbilical cord.
17. Placenta.
20. Rima pudendi.
21. Lower uterine segment.
26. Tumor.

27. Anterior superior spines.
28. Ala of sacrum.
29. Sacro-iliac articulation.
30. Ileopubic tubercle.
31. Acetabulum.
32. Ileosacral ligaments; posterior superior spines.
33. Femur.
34. Anterior inferior spines.
35. Obturator foramen.
37. Ovary.
38. Oviduct (tube).
39. Broad ligament.
40. } Anterior and posterior
41. } sacro-iliac ligaments.
42. Round ligament.
43. Ovarian ligament.
44. Sagittal suture.
45. Lesser fontanel.

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